Introduction

The literature has been abundant with theories and studies on vocabulary acquisition. One of the most intriguing questions raised by researchers has been concerned with how and where words might be stored and represented in the mind, where the center of lexical storage is assumed to be the mental lexicon. At first glance, the concept of the mental lexicon might seem straightforward, as suggested by the commonly used dictionary metaphor (Fay & Cutler, 1977), which emphasizes the analogy of pairing word meanings with their sound representations. However, as pointed out by Jarema and Libben (2007), providing a precise and concise definition of the mental lexicon poses a challenge. The reason for this stems from the fact that most psycholinguistic research aims to go beyond what is stored in the lexicon and concentrates on lexical access and how we retrieve words in order to gather information on lexical representation.

Aitchison (2012) argued that there are two underlying reasons that justify the necessity for the mental lexicon to be structured in a logical way. Firstly, the fact that there are a vast number of words calls for some sort of logical ordering, because, in her reasoning, psychologists have indicated that the human memory is “flexible and extendable” as long as “the information is structured” (p. 5). Secondly, the impossible speed with which words are searched, found, and recalled from tens (or maybe hundreds) of thousands of words implies a logical organization. Word searches and slips of the tongue, aphasic research, and psycholinguistic experiments have all been valuable sources of evidence; furthermore, our understanding of the lexical processes in the mind has also been supported by the conclusions of theoretical research. In Aitchison’s view, the closest and simplest analogy for modeling the mental lexicon is that of a map, and she provides the example of the London Underground, where the stations are connected by rails of different lengths and there are several possible ways of getting from one point to another. Even though it is easy to understand and accept this metaphor, the author warns us that, unfortunately, the links in the mental lexicon are mostly hypothetical and so far invisible, not to mention the difficulty of establishing what exactly is stored in the lexicon, all of
which means that it takes “inspired guesswork” (p. 41) to convey the sheer complexity of this storage system.

In light of this argumentation, the present chapter aims to give an up-to-date overview of the theories and models of the first language mental lexicon, followed by a similar analysis of the bilingual lexicon. Following the definition of key concepts, an argument is developed for a view of vocabulary knowledge that encompasses both mental representations encoded in memory as well as ability and control in the usage of this knowledge in producing and comprehending language. As far as research methods are concerned, we will see an abundance and diversity of techniques applied: word associations, cross-language semantic and translation priming experiments, picture-naming tasks, as well as studies on aphasia. These different approaches have all yielded ample empirical data for exploring lexical organization and access. The chapter points out that while the mental lexicon might not have a specific modular localization in the human brain, it can serve as a useful metaphor in modeling and understanding how words are stored, organized, and accessed in the different languages one speaks.

Critical Issues and Topics

The Conceptual Organization of the L1 Mental Lexicon

For the conceptualization of the mental lexicon, we need to look into the origins of this construct. In early theories of language acquisition, language was viewed as a system of grammatical rules, where words were assumed to fill the gaps in sentences, which were produced by means of the necessary morphological and syntactic transformations (Chomsky, 1965). In this view, the mental lexicon was regarded as no more than a repository of lexical, phonological, and morphological information pertaining to words. However, as the boundaries between lexis and grammar seem to diminish, “many linguists have come to see words not simply as flesh that gives life to grammatical structures, but as bones that are themselves grammatical rich entities” (Elman, 2009, p. 548). As opposed to the views held by Chomsky (1965) and other linguists, usage-based approaches assume a functional or semantic dimension of language production and comprehension as well as child language development, whereby syntactic encoding is driven by words (e.g., Tomasello, 2003). Both Bresnan’s (1982) lexical theory of syntax and Levelt’s (1989) model of speech production highlight the relevance of the syntactic features of words in triggering syntactic encoding when speakers produce sentences. These developments have had important consequences for how knowledge might be organized and represented in the mind, because syntactic regularities of language, traditionally seen as “rules”, are now seen as indistinguishable from linguistic construction units (e.g., words, phrases, formulaic expressions, and chunks). Thus, the shift from rule-based theories to usage-based models has changed the conceptualization of the mental lexicon, extending the types of knowledge that it needs to be capable of storing.

Other advances in cognitive psychology have also contributed to a more pragmatic and complex view of the mental lexicon. For one, the incorporation of Dynamic Systems Theory (van Geert, 1994) in the language acquisition process gives an account of the dynamicity of language development and emergentist theoreticians have also indicated that language acquisition is a non-modular, nonlinear process (e.g., de Bot, Lowie, Thorne, & Verspoor, 2013; Thomas & Karmiloff-Smith, 2002). In Dynamic Systems Theory, language is viewed as a structure that contains a set of interconnected subsystems, such as a lexical system, a phonological system and a syntactic system, which interact with and influence each other
Brigitta Dóczi (for a detailed discussion, see Larsen-Freeman & Cameron, 2008). In light of this, the mental lexicon might be identified as a lexical system but at the same time the boundaries with other systems are blurred. Connectionist theories also reject the idea of distinct language modules, such as the mental lexicon and a separate lexical encoding system. They claim that language storage, comprehension, and production take place with the help of a dynamic network of interrelated components stored and circulated in this vast interactive system (Elman, 1990). Cognitive Linguistic Theory further argues that language processing occurs along a “continuum of construction at all levels” (de Bot et al., 2013, p. 209), from morphemes to whole discourse level utterances. The development of such an interconnected dynamic linguistic system is simply due to repetitive language use, where observed patterns are followed and thus more and more complex structures can emerge over time. Furthermore, the developmental process is dependent on external factors (such as human cognition and processing abilities) and is subject to constant change, affecting the whole system.

These findings pose the question whether a mental lexicon actually exists and if the concept is necessary at all (Elman, 2009). Lexical processing and conceptualization might be explained without referring to a mental lexicon as a single system accountable for storing lexical and semantic information (Dilkina, McClelland, & Plaut, 2008). That being said, there is no doubt that lexical knowledge must somehow be organized even if there is no isolated area of the brain responsible for it. There may not exist a separate linguistic module, but the mental lexicon as a metaphor might help us in understanding lexical storage, retrieval, and acquisition.

In Jarema and Libben’s interpretation (2007) the mental lexicon is defined as “the cognitive system that constitutes the capacity for conscious and unconscious lexical activity” (p. 2). This definition of the lexicon seems the most adequate for the following reasons. On the one hand, incorporating a systematic view conveys the complexity of lexical organization and highlights the various processes that take place related to lexical retrieval. On the other hand, the definition of the mental lexicon as a capacity enables us to take all the aspects of language into consideration: including the possession, acquisition, conceptualization, use, and loss of lexical knowledge. Even if we are often unaware of the phenomenon, what is subject to the greatest change and development in our lifetime among all the aspects of language is our lexical knowledge. This indicates that the mental lexicon is in constant flux. Therefore, we adopt this characterization of the mental lexicon as a system with capacity because it draws our attention to all the processes that can be achieved.

As for the organization of concepts in the lexicon, several models have been put forward. In the following section the earliest and most fundamental models of the lexical organization are outlined, followed by the problematic issues related to them, as well as how these are viewed in the most recent literature.

**Early Models of Lexical Organization**

One of the first theoretical models was Collins and Quillian’s *hierarchical network model* (1969, 1970, 1972), which assumes that information in our memory is stored in categories linked to one another in a hierarchical fashion and organized as “pyramids” with superordinate categories (e.g., *animal*) at the top, more specific ones in the middle (*bird* or *fish*), and subordinate ones (e.g., *penguin* or *salmon*) at the bottom of the hierarchy (Collins & Quillian, 1969, p. 242).

The *hierarchical network model* claims that single words with their typical features are only linked to the closest concepts (Figure 4.1). This results in what is referred to as cognitive
Lexical Representation in the Mental Lexicon

Economy, which implies that one type of information only appears at one level of the hierarchy: the highest one possible. For example, the feature that birds can move is stored at the highest level animal. Another characteristic of the model is category size effect, which refers to the phenomenon that when faced with two sentences, such as Robin is a bird and Robin is an animal, less time is needed to verify the sentence Robin is a bird, as it is a subcategory of the term animal. The justification for this lies in the fact that as the category becomes larger, it becomes more abstract, therefore, the number of defining features decrease and the retrieval process takes longer because the brain needs more scanning to verify the information (Collins & Quillian, 1969, 1970).

However, it is important to note that the hierarchical network model has raised several concerns over the years. One is the so-called typicality effect, meaning that not all the instances of a concept are equally good examples of it; for example, a shark or a guppy might be more of a typical fish than a blue ray. The “familiarity effect” is also problematic: experiments have indicated that the retrieval process is shorter for familiar characteristics (e.g., sharks are predators) than for unfamiliar ones (sharks’ skeletons are made of cartilage and connective tissue). Thirdly, cognitive economy seems to be violated as features might belong to more or sometimes all the categories of the hierarchy and not necessarily only the closest one. For instance, in the case of a penguin, it might be categorized as an animal even before the category bird, triggering the activation of a higher category first.

The other feature-oriented model constructed is the semantic feature or feature comparison model (Smith, Shoben, & Rips, 1974), which is based on the premise that concepts are stored as sets of attributes in our memory. For example, a bird might be considered to have characteristics like having feathers and wings, being able to fly, and lay eggs, while a robin...
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has feathers and wings, can fly, lays eggs, can be red-breasted, is small, and hops. As the features might vary in the extent to which they are central to the description of the given concept, the basic tenet of this theory is that there are two distinctive sets of attributes stored in the mental lexicon: defining and characteristic features (Figure 4.2). The main difference between these two categories arises from the fact that, whereas defining features are fundamental to the definition of the concept, characteristic features are typical but not salient.

Certain aspects of the semantic feature model provide an explanation for what the hierarchical network model cannot. First, as the concept robin shares more defining features with the notion of bird than with that of ostrich, a robin can be seen as a more typical bird than an ostrich. The problem of the typicality effect is resolved and we can explain why a sentence like *A robin is a bird* might be verified faster than *An ostrich is a bird*. The semantic feature model also justifies the rejection of false sentences, such as *An ostrich is a fish*, as these two concepts would share very few categories, which points to the fact that category size effect is overcome. Finally, the semantic feature model accounts for hedges like *Whales are sort of fish*. The rationale behind this phenomenon is that although they do not belong to the same category, they share certain characteristic features with them (e.g., the fact that they live in water).

Unfortunately, in spite of all the perceivable positive features of the two models just mentioned, it was shown that both the hierarchical model and the semantic feature model failed to predict reaction times, and were also influenced by other factors, such as the form of a word and the order in which participants encountered them. Finally, some ambiguous concepts, such as *game*, might have vague defining features or they may fall into

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**Figure 4.2** The semantic feature model

*Source: Adapted from Smith et al., 1974*
categories that are too large (e.g., plant or animal), making the processing longer (Housel & Acker, 1977).

Similar to the previously mentioned hierarchical and semantic feature models, the spreading activation model also assumes that it is concepts, rather than words, that are activated in the mental lexicon. However, in the spreading activation model (Collins & Quillian, 1969, 1970) concepts are viewed as connected nodes where the distance between concepts depends on the degree of their association (see Figure 4.3). Collins and Loftus (1975) hypothesized that there are two separate networks for storing data in the mental lexicon: one for lexical information such as orthography and phonology, while the other is strictly semantic and stores information about concepts. Nevertheless, the two network systems are seen to be in close relation to each other (Collins & Loftus, as cited in Ferrand & New, 2004).

There are two reasons why the spreading activation model has come to be accepted as the most well-established out of the three theories. Because the mental lexicon has recently been pictured as a network of associations, instead of a rigidly hierarchical structure, this implies that each word might be related to several others. Furthermore, the fact that some links are stronger obviates the need to differentiate between defining and characteristic features. The spreading activation model also explains why positive priming tasks work: when participants are given a closely associated word (a prime) before a target word, they perform better in the process of retrieval, which indicates that there is a stronger link between certain notions (Reisberg, 2007).

However, one of the problematic issues with the spreading activation model is the fact that it assumes that every person possesses an entirely different mental lexicon. This leads to difficulties in finding emerging patterns with regard to lexical access or production. Moreover, as the model is based on concepts, it fails to take into consideration other aspects of word knowledge, such as phonology, orthography, or syntax (Bock & Levelt, 1994). This problem was solved in Bock and Levelt’s revised spreading activation model (1994), where, apart from the conceptual connections, various levels of a lexical entry are marked, accounting for

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**Figure 4.3** The spreading activation model

*Source: Adapted from Collins & Loftus, 1975*
syntax as well as phonology (Figure 4.4). There is a similarity between the revised spreading activation model and Aitchison’s cobweb theory (2012) because they both argue that lexical items might be linked to others according to phonology, orthography, syntax, or semantics.

Storage, Lexical Selection, and Retrieval in the Mental Lexicon

As we turn our attention to more current views on the structure and organization of the mental lexicon, it is important to clarify what types of information it may contain: conceptual (the ideas to be expressed), morphological (lemmas or word forms), and semantic (word meanings). In psycholinguistics the construct of vocabulary entails the storage and retrieval of words from the language processing system and the entity of lemma is regarded as the basic unit of lexical storage and representation in the mental lexicon. According to Levelt’s (1989) model of speech production (see Figure 4.5), lexical encoding involves three steps: first, depending on the speaker’s intention, the relevant concept is selected, and this is followed by the retrieval of the corresponding lemma, which contains information about the syntactic and morphological characteristics of the lexical unit in question. Last, the phonological form of the lemma, the so-called lexeme, is extracted and the word is pronounced. It is still a question of debate in psycholinguistic studies of lexical access whether the lemma contains semantic as well as syntactic information. Neurological research suggests that a lemma contains only syntactic information and the word meaning is stored at the conceptual level (Levelt, Roelofs, & Meyer, 1999).

However, as researchers have pointed out (Jarvis, 2009; Kormos, 2006; Pavlenko, 1999, 2009), the term concept had been applied inconsistently and thus the definitions of conceptual
knowledge and semantic knowledge were not precisely defined or differentiated in the field of psycholinguistics. While the former notion refers to concepts and ideas stemming from thought processes, experience, various schemas, and mental images, which are “organized into structured categories of thought and categories of meaning” (Jarvis, 2009, p. 101), the latter construct represents word meaning, that is, the mental links between lemmas and concepts as well as lemmas and other lemmas. The significance of this distinction becomes all the more apparent in regard to the conceptualization of the bilingual lexicon, which will be discussed in the second part of this chapter.

The philosophical question that arises from this is whether conceptual and semantic representations should be distinguished, which has been a point of contention in the literature. Some researchers, such as de Groot and Keijzer (2000) and Francis (2005), have argued for the interrelationship of conceptual and semantic information. Founded on the work of Hintzman (1986), their argument claims that abstract knowledge, such as that of word meanings, should not be separated from knowledge of concepts, because both are part of an exemplar made up of all the memory traces that originate from previous experiences. This way both the concept and the meaning of a word comprise a complete set of these traces and when a specific word, such as “happiness” is accessed, it results in the activation of all the memory traces that contain significant information in relation to this particular concept. The implication of this view is that these traces are culture-bound and may vary, depending on the language and the culture. By contrast, other researchers (e.g., Paradis, 2000; Pavlenko, 1999, 2009) argue that concepts can exist independent of word meanings as they are “multisensory units of meaning independent of whether a corresponding word exists” (Paradis, 2000, p. 22) and “language is only one way to access concepts” (ibid.).

The dichotomy between the separatist and integrated perspectives has led to an ongoing debate and two opposing views with regard to the theoretical representation of conceptual and semantic knowledge in the mental lexicon. The one-level view proposes that the two types of knowledge should be viewed as indistinguishable. In Roelofs’ (1992) and Levelt et al.’s (1999) models of lexical access, concepts and word meanings are undivided units that are stored and activated together. Concepts can be either lexical (i.e., there is a single-word representation for them) or non-lexical (i.e., they can be expressed with a multiword phrase or sentence) and they are manifested by independent nodes that are linked to each other (for a detailed discussion, see Roelofs, 2000). In this sense, lexical representations (word meanings) are viewed as a subset of all conceptual representations. Culture and language specificity allow speakers of different languages to have a distinct conceptual representation of a single concept; for example, the English word “summer” might entail completely

![Figure 4.5 The process of lexical selection](Source: Adapted from Levelt et al., 1999)
different associations in various languages. Additionally, lexical representations are also built upon and linked to imagery and background information. When accessing a lexical entry, concepts are activated and they spread activation to lemmas, which comprise syntactic and morphological (but not semantic) knowledge. Lemmas are also incorporated into an integrated network, where activation can also spread item by item. Roelofs (2000) justifies aphasic patients’ failure to access semantic representations, even though they were aware of the concepts and were able to describe them, by referring to the damage in the links between the conceptual and lemma levels. Another source of evidence that lexical and semantic knowledge are part of a common cognitive system has been produced by semantic dementia patients (see Dilkina, McClelland, & Plaut, 2010).

The two-level view advocated by Paradis (1997, 2000) and Pavlenko (1999, 2009) makes a distinction between conceptual and semantic knowledge. Similar to the integrated theory, concepts are also seen as interconnected networks of features that receive various degrees of activation based on the given communicative context. However, Paradis (2000) argues that semantic knowledge is not a component of the concept itself but of the language system, and conceptual and lexical characteristics “map onto each other, but are distinct entities” (p. 24). His observations originate from research on aphasia, which reported aphasic patients’ failure to retrieve lexical entries despite the fact that they were able to access the conceptual features of the given word. Pavlenko (1999, 2009) believes that it is also necessary to distinguish between conceptual and semantic representations due to the cultural differences between various languages.

With regard to lexical representation, another question is that of stability (or instability). De Bot and Lowie (2010) criticized previous research and models, most of which was based on word associations, translation, and picture recognition tasks, for assuming that lexical representations are stable and invariant. In fact, they contend that, similar to all other aspects of language processing, lexical representations need to be viewed as “dynamic, episodic and therefore inherently unstable” (p. 117). They also highlight the relevance of time, context-sensitivity, and prior use. They suggest that the stability of lexical representation may also be dependent on lexical subsets, which are determined and influenced by factors such as context, frequency, register, recency, and language variety. Since a particular lexical item may belong to several subsets at the same time with varying degrees of connections, there is considerable variation in terms of ease of access and retrieval in this dynamic network.

The Bilingual Lexicon: An Interactive Network System

As we have seen in the previous sections, defining the mental lexicon poses a challenge, so when a speaker starts to use a second or third language, conceptualizing the mental lexicon is even more difficult. In the field of psycholinguistics, opposing views have emerged as to whether the lexical items of the different languages one speaks are stored separately or in a common lexicon with interrelated concepts (Pavlenko, 1999, 2009; Kormos, 2006; Singleton, 2007). The aim of the next section is to address this ongoing debate and look at the available evidence.

In support of the separatist perspective, Meara’s (1982, 1984 as cited in Wolter, 2001) findings based on word association tests, revealed that in comparison to the L1 lexicon, there are less stable connections for words in the L2 lexicon and semantic links are also qualitatively different. Furthermore, he also found that phonology may have a significant organizing role in the L2 lexicon. Singleton (2007) also presented evidence in favor of separate mental lexicons. One of his arguments posited that since languages are based on highly
divergent morpho-syntactic and phonological structures, bilingual and multilingual speakers need to refer to analogies based on the newly acquired language system. This implies separate routes for lexical access and activation. Additional support for separation was provided by aphasic patients and extreme cases of L1 attriters, who only experienced loss in one of their languages (Paradis & Goldblum, 1989; Schmid, 2002).

Currently, there is a more widely accepted view that there is a shared lexicon manifested as an interactive network system. However, the degree of interaction within the system is still in debate. The idea of a common storage system was first supported by reaction time experiments with cognates, which demonstrated that lexical units of both languages are activated and compete for selection (Colomé & Miozzo, 2010). Later studies also addressed the role of frequency and word length, while recent research has turned attention to lexical availability and the role of various semantic categories. For example, a recent study investigated how more abstract prompts, such as emotion words, might affect lexical access (see Catalan & Dewaele, 2017). Another determining factor has been the level of proficiency. For instance, in the case of advanced L2 speakers, both languages have been found to receive activation (Shook & Marian, 2012) and lexical access through translation happens faster, whereas less fluent bilinguals are slower at accessing lexical and conceptual connections (Dufour & Kroll, 1995). Thirdly, if the morphological systems of the two languages are similar, it triggers faster translation (for an overview see Kroll & Tokowitz, 2009). More recently the attention has shifted from the notion of commonality to the extent of this interconnectedness. In an attempt to investigate the bilingual network system, Wolter (2001) and Zareva and Wolter (2012) both indicated that in the case of well-known words there are differences in the types of connections between L1 and L2 words, while conversely, for less well-known words the links were found to be more similar. These findings are also supported by Wilks and Meara (2002), who claim that there is a higher number of connections at the core of the lexicon than at the periphery, and they postulate that the network structures of L1 and L2 lexicons might differ, because the links between L1 lexical items are stronger and more salient than the connections between L2 words. They claim that there is a higher number of links at the core of the lexicon than at the periphery with weightier links between L1 lexical items. In Wolter’s view, depth of word knowledge might have a significant role in determining how well lexical items are integrated into the bilingual lexicon (Wolter, 2001). Since dimensions of lexical knowledge appear to be acquired incrementally (see Dóczi & Kormos, 2016), this results in various strengths of connectivity and susceptibility to constant change in the lexicon. The strength in links is also influenced by cross-linguistic factors which may determine the level of interconnectedness (Pavlenko, 2009; Singleton, 2007). Pavlenko (2009) illustrated this with cross-linguistic semantic priming and picture naming experiments and stated that morphological and phonological representations might be stored at separate levels, whereas words meanings and concepts are mostly shared.

As reported by Pavlenko (2014), recent research has also indicated that bilinguals and multilinguals experience a substantial amount of interaction between their languages in both directions, referred to as bidirectional transfer or cross-linguistic influence. In other words, since the two languages exert a continuous effect on each other, L1 and L2 lexical representations might be modified at any time, causing changes in the connection weights (strength of links) between concepts and their lexical representations in both languages. There is growing evidence that these cross-connections might also impact L1 connections, challenging the assumption of a stable L1 (Malt, Li, Pavlenko, Zhu, & Ameel, 2015).
Lexical Access in the Bilingual Mental Lexicon

Although the models used for lexical organization in the mother tongue have also been justified for bilinguals, they have been revised slightly for lexical access in the second language. In their theoretical overview, French and Jacquet (2004) outlined four types of hierarchical models of lexical organization for bilinguals: the word association, concept-mediation, mixed, and revised hierarchical models. Founded on the hierarchical model of Potter, So, Von Eckhardt, and Feldman (1984), which differentiates between concepts and word meanings, each of the models is characterized by a separate set of lexis for each language, as well as a common conceptual base. However, it is “the location and weighting of the links” (French & Jacquet, 2004, p. 88) that differentiates the models from each other, as detailed in the next section.

The basic tenet of the word-association model is that L2 lexical items are directly connected only to their L1 equivalents, but not to their corresponding concepts, which renders the recall of a concept unnecessary when an L1 word is translated into L2 (Figure 4.6). Researchers like French and Jacquet (2004) as well as Kormos (2006) have pointed out the fact that this model is the most suitable for modeling L2 lexical knowledge in the case of lower level speakers, as studies have shown that their reactions were faster to L2 translations than images of words, and they were also faster at translating cognates than noncognates (Kroll & Curley, 1988; Chen & Leung, 1989).

In the concept-mediation model, both L1 and L2 words are linked to the same concept but not to each other (Figure 4.7). Contrary to the previous alternative, this theory is applicable in the case of higher-level L2 proficiency speakers who do not need to rely any more on L1 translations to access concepts. Potter et al.’s study (1984) can serve as support for this model, as they found that proficient L2 speakers were faster at naming pictures than providing L1 equivalents for the same words.

The mixed model, as suggested by its name, is a combination of the former theories and assumes that L1 and L2 words are linked to each other, as well as to a shared concept (Figure 4.8). The rationale behind this is that even as learners’ level of proficiency increases, the link between L1 and L2 words does not necessarily disappear: there may be different routes of activation for different word types, and several factors, such as the level of abstractness and similarity in word form, might also influence lexical access. For example, a study

![Figure 4.6 The word-association model](source: Adapted from French & Jacquet, 2004)
by Talamas, Kroll, and Dufour (1995) revealed that advanced L2 learners rejected L1–L2 word pairs more slowly if they were semantically related, and accepted them faster if they were cognates.

The fourth model to be presented here is the revised hierarchical model of Kroll and Stewart (1990, 1994), which also features one shared concept and links between L1 and L2 equivalents. However, the novelty of the model comes from the difference in the strength of the links, which depend on the direction (Déczi & Kormos, 2016). As indicated in Figure 4.9, there is a stronger link between a concept and its semantic representation in L1 and we can suppose weaker links between the translation equivalents in the direction of L1 to L2 than from L2 to L1. A number of studies found evidence to support this as participants needed less time to recognize L1 words than images of concepts (see Kormos, 2006). The model has also been praised for showing the developmental progress and changes in the direction of links between conceptual and semantic representation, illustrating the dynamic nature of the bilingual lexicon (Altarriba & Basnight-Brown, 2009). From the perspective of language development, the revised hierarchical model successfully accounts for the importance of
L1–L2 connectivity in the case of lower level learners, because they need L1 translation equivalents to access L2 words. However, as they become more proficient, the formation and strengthening of links between L2 words and concepts makes the L1 translation redundant. Nevertheless, the model has been challenged on the grounds that concepts might be culture or language-bound and they might not have overlapping conceptual representations (Pavlenko, 2009).

In contrast to the previous theories, de Groot’s conceptual feature model, or distributed feature model (1992), is based on the assumption that although words are connected to concepts, a given word might have a similar or a different representation in the two languages (see Figure 4.10). In fact, certain words (such as a concrete word like chair) might share their conceptual representation in both languages, others may be partially overlapping, and in the case of some words, the conceptual representations might have very little or nothing in common. An example of partial overlap might be the conceptual representation of love in English and Hungarian, because while the concept covers both human and romantic feelings in English, these are represented by two different concepts in Hungarian. This framework successfully accounts for cross-linguistic differences, as demonstrated by de Groot (1992) and van Hell and de Groot (1998). The researchers found that cognates and concrete words were translated faster by bilinguals than noncognates and abstract words. Nevertheless, Pavlenko (2009) challenged the model for a number of reasons. On the one hand, it fails to take into account the context of words, and contrary to the revised hierarchical model, it does not reflect language and vocabulary development. Pavlenko’s concern also derives from the fact that although concrete words and cognates were used to support the framework, it may not necessarily imply that they have completely overlapping conceptual representations.
The dynamic nature of lexical development is reflected in Dong’s *shared asymmetrical model* (as cited in Pavlenko, 2009). In this model the L1 and L2 lexicons are linked, with connections to a common repository of shared conceptual elements (see Figure 4.11). In Pavlenko’s view, even though the concepts are vaguely represented in the model, both the differences across the two languages and the developmental process are accounted for.

In one of the most recent models, Pavlenko (2009) aimed to incorporate the positive aspects of earlier frameworks. Similar to the revised hierarchical model, the modified hierarchical model (Figure 4.12) emphasizes the “developmental progression from lexical to
conceptual mediation” (p. 146), while also accounting for cross-linguistic and cross-cultural differences between languages. These features were present in the *distributed feature* and *shared asymmetrical models*. The uniqueness of the model is due to the distinction between language-specific, partially shared, and completely overlapping conceptual features. As an example of a language-specific concept, Pavlenko provided the examples of *privacy* and *frustration*, two concepts that might not be understood in certain cultures. She addressed the difficulty of formulation in the case of such words and provided examples from earlier studies, where participants overcame this by relying on “code-switching, lexical borrowing or loan translation” (p. 147). Pavlenko also stressed the relevance of context-dependence and task-performance, which are both reflected in her framework. Most importantly, the *modified hierarchical model* accounts for all the continuous implicit restructuring of the mental lexicon that might occur when encountering unknown L2 concepts. The model suggests that if there is no L1 concept available, links between concepts and lexical items can be restructured or inhibited when necessary, depending on the linguistic and social context. This also solves the problem of having two concepts for one lexical item (as the concepts “tongue” and “language” only have one lexical representation “nyelv” in Hungarian) for the process of semantic transfer. The greatest strengths of the model come from the assumption that conceptual and lexical categorizations can be clearly defined and separated, and the fact that the process of activation “becomes a two-way interaction between the mind and the environment” (p. 147).

**Future Directions**

While the lexical decision task was most frequently used in earlier research on the mental lexicon, recently, other, more varied research methods have been applied in the field (Libben, 2017). Libben postulated that several aspects of psycholinguistic research on the mental lexicon make it comparable to research on quantum physics, and he also pointed to the impossibility of concrete physical conceptualization in the brain. In his view, we have yet to actually see a word in the mind, and words should rather be conceptualized “as encapsulating a set of possibilities that may or may not be manifested by individual speakers of a language” (p. 54). This change in perspective and incorporating notions of quantum physics might provide an exciting avenue for further research.

Another emerging area is the utilization of network science to quantitatively observe complex network structures in lexical processing (see Castro & Stella, 2018; Stella & Brede, 2015). For example, Stella, Beckage, and Brede (2017) and Stella, Beckage, Brede, and De Domenico (2018) propose a multiplex lexical framework for modeling early language acquisition, where connectivity is based on relationships such as free association, co-occurrence of words, similarity of features, or phonological representation. To further test their hypothesis, the authors call for more longitudinal investigations as well as the inclusion of different age groups.

There is also further research potential in the use of both word association data and text-corpus data in modeling lexical knowledge in order to explore developmental changes. According to De Deyne and his colleagues (2016), while the former type of analytical tool is able to provide a more direct view into the mental lexicon, the latter one is more adept at demonstrating how language might shape the processes and dynamics of its structure.

On another front, there seems to be a lot of potential in exploring the organization of the second language mental lexicon with the help of computational tools as well. In a recent
study by Borodkin, Kenett, Faust, and Mashal (2016), the authors found that even highly proficient second language learners displayed less modular and more local connections in their second language compared to their mother tongue. In an attempt to deepen our knowledge of bilingual lexical processing, it may be interesting to examine to what extent other factors, such as age, level, and language-learning background might affect the structural links and their characteristics in the second (or perhaps third) language lexicon.

**Conclusion**

The present chapter has reviewed both theoretical and empirical evidence regarding the construct and systematic organization of the mental lexicon. In contrast to earlier theories, using vocabulary is no longer viewed as filling the slots in a sentence with the help of various transformations. Instead, it is viewed as linguistic construction units (e.g., words, lexical phrases, and formulaic expressions) in their own right, which cannot be separated from their syntactic regularities. This has led to a paramount shift in our view of the mental lexicon, which is now regarded as a complex and dynamic subsystem responsible for both conscious and unconscious lexical processes. The mental lexicon is now conceptualized as an integrated network of lexical items. This flexible network view of the lexicon is in line with Dynamic Systems Theory, as well as other connectionist theories that suppose a single-system view, where there are no lexicons per se, but the underlying representation of lexical knowledge is based on features, exemplars, and associations rather than concepts.

In the earliest, feature-oriented models of the mental lexicon the emphasis was on lexical organization rather than how lexical items are accessed or retrieved. Bock and Levelt’s (1994) revised spreading activation model appears to have overcome this issue, because apart from the conceptual layer, syntax and phonology are also accounted for. Lexical selection is divided into three consecutive stages: (1) concepts are selected and activated, (2) the corresponding lemma is retrieved, and (3) the corresponding lexeme is assigned and triggered using the relevant morphological and phonological information. Psycholinguistic research has also addressed the interrelationship of conceptual and semantic knowledge and it is still a debated question whether the lemma contains syntactic information relating to a particular lexical entry.

From the perspective of the bilingual lexicon, researchers have focused on the issue of language specificity and there is growing evidence that the L2 network is less well-organized than its L1 equivalent. What we know now is that L1 and L2 lexical items are connected with each other, as well as with elements of the conceptual layer to varying degrees. Moreover, it is also clear that their influence on each other is continuous and bi-directional. Models for the organization of the bilingual lexicon are founded on L1 models but they have been slightly revised in an attempt to reflect its complexity. The most recent and detailed model of Pavlenko (2009) is characterized by aspects such as the strength of the links and associations between L1 and L2 words, conceptual representation and cross-cultural differences, and developmental progress.

Although there are still a lot of questions and considerable debate among researchers with regard to lexical organization, access, selection, and which research methods are most suitable for investigation, it is unquestionable that the mental lexicon is susceptible to constant adjustment and restructuring, depending on several factors. These factors include context, frequency, and recency of use, which results in a lot of variation and variability rather than stability.
Further Reading


This classic reflects upon our basic knowledge of the mental lexicon and its structure in order to demonstrate how we learn, store, and retrieve words. Aitchison’s *Words in the Mind* presents the results of a growing body of research to a wider audience interested in the conceptualization of the mental lexicon. The newest (4th) edition has been expanded, contains a new chapter on meaning change, and includes new references.


This edited volume gives insight into concepts related to human cognition and the mental lexicon by focusing on lexical representation and processing in the mind. It provides a thorough overview of concepts, issues, and research findings in the field.


This thematic volume bring together key perspectives related to the bilingual mental lexicon, including the nature of conceptual representation and semantic processing. It covers a wide range of views on the investigative techniques applied in psycholinguistics and also develops new models of lexical processing in the second language.

Related Topics

Single-word items, multiword items, lexical processing, theories of second language learning

References


Lexical Representation in the Mental Lexicon


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Brigitta Dóczi


