LEXICAL ACCESS IN SPEECH PRODUCTION: A BRIEF LITERATURE REVIEW

Mailce Borges Mota Fortkamp,
Gicele Vergine Vieira Prebianca,
Ana Paula de Oliveira Pires (UFSC)

RESUMO: Falar envolve a expressão de pensamentos e conceitos em palavras. A fim de realizar este processo, os falantes devem selecionar, do seu léxico mental, os itens lexicais que representam suas intenções comunicativas mais apropriadamente. Isto é o que se denomina frequentemente de *acesso lexical*. De acordo com várias teorias sobre a produção da fala, parece haver um consenso de que o processo de acesso lexical envolve dois grandes estágios: recuperação do lemma[1] e codificação da forma da palavra (propriedades fonológicas). Neste artigo, nosso foco é a recuperação do lemma, visando, assim, discutir (1) as duas diferentes visões sobre a seleção dos itens lexicais: decomposicional e não-decomposicional, (2) os mecanismos cognitivos que subjazem a seleção lexical, (3) as principais pesquisas sobre acesso lexical em L1, e (4) estudos de acesso lexical em L2. No presente artigo, nós, primeiramente, descrevemos a arquitetura funcional do sistema de produção da fala. Em seguida, apresentamos a principal visão de acesso lexical que emerge das teorias da área, particularmente as abordagens decomposicional e não-decomposicional, e os mecanismos cognitivos que embasam a recuperação do lemma. Num terceiro momento, estudos na área de acesso lexical em L1 são abordados e discutidos. Em seguida, os principais resultados de estudos sobre acesso lexical em L2 são apresentados. Finalmente, baseados na literatura previamente revisada, nós fazemos referência à alguns dos aspectos atuais intrigantes em relação ao acesso lexical, mais especificamente, à recuperação do lemma.

PALAVRAS-CHAVE: acesso lexical, recuperação do lemma, produção oral, mecanismos cognitivos, léxico mental.

1. Lexical access: a core process in speech production

It has been assumed that selecting and preparing words to utter is a core issue in speech production which requires the realization of several complex mental processes in the speaker's cognitive system (LEVELT, 1989; LEVELT et al, 1999). A major step in the elaboration of to-be-expressed words is the so-called lexical access. Lexical access (selection) is then the act of "retrieving a word, or more specifically a lemma, from the mental lexicon, given a lexical concept to be expressed" (LEVELT et al, 1999, p. 4).

Most lexical access theories agree that word retrieval and production encompasses two steps: lemma retrieval and word-form encoding (COSTA et al 1999; COSTA et al 2000; COLOMÉ 2001; LEVELT et al 1999; LEVELT, 2001). However, the fact that lexical items seem to be more than simple entries of a dictionary (i.e. the mental lexicon), posits some constraints on the choice of the appropriate words to convey the intended message (BIERWISCH & SCHREUDER, 1992). First, are lexical items stored as single non-decompositional units or do they consist of complex internal structures and their respectively conceptual primitives? Second, what cognitive mechanisms underlie lexical selection?

In the following sub-sections we review the main assumptions underlying the non-decompositional and the decompositional views of lexical access as well as the cognitive aspects of word selection in terms of functional architecture and dynamics of the system.

1.1 Non-decomposition or decomposition?

A widely accepted principle of lexical access in speech production assumes that spreading-activation is the fuel of the system by means of which multiple semantic representations become potential candidates for selection (COSTA et al, 2000; CARAMAZZA, 1997; DELL et al, 1999; DELL, 1986; LEVELT et al 1999; ROELOFS, 1992). According to this principle, when naming a picture of a *rose*, for instance, several other semantically related words such as *daisy* and *flower* become activated as well.

As explained by Levelt (1989, 1992), if the speaker decides to utter *flower* instead of *rose*, then a problem, known as the hyperonym problem, is constituted. The hyperonym is constituted because when accessing the lemma *rose*, all the conceptual characteristics of the word *flower* are also satisfied, that is, *rose* entails the meaning of *flower*. Then, *flower* is said to be the hyperonym of *rose*.

It is noteworthy that the hyperonym problem seems to arise from the decompositional view of lexical access, in which words share semantic characteristics. That is, the decompositional view postulates that lemmas can be decomposed into primitives that correspond to the conceptual specifications of the intended message. If the intention is to verbalize the lemma BOY, for instance, then the conditions *human*, *male*, and *young* must be met (DE BOT & SCHREUDER, 1993).

According to Bierwisch and Schreuder (1992), there is not a clear-cut link between concepts and words. Therefore, when words have some conceptual primitives in common, more than one lemma may be activated. In order to deal with this problem, Bierwisch and Schreuder (1992) formulated a matching principle in which a lemma is selected if and only if it contains all the conceptual primitives specified in the to-be-lexicalized-chunk. In other words, a particular lemma is selected from the mental lexicon only if it contains all and just those semantic characteristics present in the to-be-lexicalizable chunk, thus allowing for a perfect fit between concepts and their lexical representations (DE BOT & SCHREUDER, 1993).

On the other hand, it would be simpler to accept the idea that multiple semantic representations are activated simultaneously only because they are interconnected and thus, give up the decompositional view (LEVELT, 1992). Non-decompositional theories postulate the existence of an indirect link between concepts and the so-called lemma nodes, which is only possible due to the implementation of a conceptual node in the mental lexicon. Once the to-be-verbalized concepts are defined, they spread activation to their respective concept nodes, which, in turn, activate their specific lemma nodes. With the implementation of concept nodes, the hyperonym problem strongly decreases (ROELOFS, 1992).

In sum, the decompositional and non-decompositional views of lexical access differ in the way concepts and thoughts are translated into words, more specifically in the activation and selection of particular lemmas to fit the communicative purpose represented by those concepts and thoughts. Whereas the decompositional view advocates in favor of compositionality in semantic representations in which lemmas are re-

trieved on the basis of a combination of specificities and semantic features; the non-decompositional approach claims that lemmas are represented by independent nodes stored in the mental lexicon, and therefore can be selected through the activation of the node that matches the to-be-verbalized concept.

Regarding the assumptions supporting the non-decompositional and the decompositional views of lexical access, two proposals aiming at dealing with the match between concepts and words, are reviewed in the next sub-section: (1) Bierwisch and Schreuder's (1992) Verbalizer model and Levelt, Roelofs and Meyer (1999) spreading-activation theory of lexical access.

1.2 Lemma retrieval: cognitive aspects

According to Levelt's (1989) speech production model and its L2 derivates, lexical selection occurs within the Formulator[2] component, which is in charge of selecting the appropriate lexical items and encoding syntactic, grammatical and phonological features to the message (see POULISSE & BONGAERTS, 1994 and DE BOT, 1992 for details on bilingual speech production).

A major challenge for speech production models, however, is to explain how speakers are able to go from intentions and thoughts to the verbalization of a message consisting of appropriate lexical items. This is particularly intriguing since, as claimed by Bierwisch and Schreuder (1992), there is no one-to-one mapping between concepts and words. In addition, De Bot and Schreuder (1993) note that different languages may lexicalize in different ways, thus posing an extra load on the cognitive mechanisms responsible for lexical selection.

Aiming at solving this matching problem, Bierwisch and Schreuder (1992), elaborating on Levelt's (1989) speech production model, suggest the addition of another component to the system – the Verbalizer, whose function is to map the to-be-verbalized concepts presented by the Conceptualizer[3] to the Formulator onto lemma representations in the mental lexicon. In other words, as the Conceptualizer does not present the Formulator with a list of lexicalizable concepts but rather strings of conceptual primitives to be lexicalized, it seems plausible to assume that multiple conceptual representations cannot be expressed by a single lexical

item, thus requiring the fragmentation of the conceptual primitives into chunks by the Verbalizer (Vbl), which then matches the to-be-lexicalized-chunks with the semantic specifications of the lemmas.

Nevertheless, such an account is not without criticisms. A central problem seems to understand how messages are chunked. As pointed out by Poulisse (1999), the chunking process is still a matter of debate since little is known about how exactly it occurs and what would characterize a chunk itself. In turn, the matching problem could be easily solved if we assume that feedback among speech processing components is possible. In this case, the Verbalizer would inform the Conceptualizer which fragments could be chunked into lexicalizable items. However, allowing for a flow of information in the opposite direction (from Verbalizer to Conceptualizer) would imply breaking down the modularity principle proposed by Levelt (1989), which strictly forbids feedback among speech production components (POULISSE, 1999).

In contrast to Bierwisch and Schreuder (1992), a feedforward spreading-activation theory of conceptually driven lexical access is proposed by Levelt, Roelofs and Meyer (1999), namely WEAVER ++[4]. In this theory, the mental lexicon is conceived as a network of independent strata of nodes. The first level of nodes, the so-called conceptual stratum contains the concept nodes which are linked to their respectively lexical concepts. The second is a lemma stratum comprising lemma nodes and their syntactic properties. Once lemma selection occurs, activation spreads to the next stratum – the form stratum, in which morpheme and segment nodes are stored (LEVELT et al, 1999; ROELOFS, 1992). In general terms, lexical selection is accomplished by enhancing the level of activation of the node of the to-be-lexicalized-concept, which in turn, activates the lemma node (ROELOFS, 1992). The fact that concepts are not directly linked to lemmas but rather to their particular concept nodes seems to account for several problems posed by the decompositional views of lexical access such as hyperonym, matching, and chunking problems.

2. L1 LEXICAL ACCESS RESEARCH

Empirical research on L1 lexical access has been mostly concerned with the distinction between the two main processes involved in the selection and production of words: lemma retrieval and word-form encoding (SCHRIEFERS, MEYER & LEVELT, 1990; CARAMAZZA, 1997; DELL & O'SEAGHDHA, 1991; LEVELT et al, 1991a, 1991b). Most studies have been conducted under the light of the picture-word interference paradigm and have shown mixed results (SCHRIEFERS et al, 1990, ROELOFS, 1992; MORSELLA & MIOZZO, 2002; GLASER & DÜNGRLHOFF, 1984).

Schriefers, Meyer and Levelt (1990) carried out three experiments in order to, first, test for the assumption that lexical access proceeds into two separate and sequential stages, a semantic and a phonological one, and second, to trace the time course of meaning and form activation during a picture-naming task. In the first experiment, 32 pictures were presented under 5 different interfering-stimulus conditions – silence (words were presented alone), blanco (words were coupled with the word 'blank'), unrelated (words were coupled with unrelated words), noise (words were coupled with unrelated words and accompanied by a noise sound with the same length of the unrelated word), and noise200 (similar to the noise condition, except that the length of the noise sound was extended by 200ms) and at 2 different points in time – together with the onset of the picture (SOA[5]=0) and 300 ms (SOA=+300) after the onset of the picture. The interfering stimuli were presented auditorily. After a training session, participants were required to name the pictures as fast as possible, while the reaction time was recorded.

Experiment two was with 16 pictures of the first experiment. The pictures were also presented under five interfering-stimulus conditions, which were the same used in Experiment 1, except for the phonological and semantic conditions. Whereas in the former, words were coupled with phonologically related words, in the latter a semantically related stimulus was introduced. The interfering stimuli were presented at three different SOAs: 150ms before the onset of the picture (SOA=-150), together with picture onset (SOA=0), and 150ms after picture onset (SOA=+150). The procedures were the same of Experiment 1.

As a significant semantic interference effect was found previous to the presentation of the picture (at a negative SOA) in experiment 2, a third experiment was run in order to ensure that this interference was a result of the lemma retrieval stage rather than a product of the visual processing of the picture. The experiment was then designed so that the participants would indicate whether a specific picture was part of a list of pictures previously studied. There were 32 pictures and each of them was combined with a semantically related word and an unrelated one. Data analysis showed that when participants performed a different task (picture categorizing, in this case) the semantic interference effect vanished, which suggests that the interference obtained in experiment 2 might be attributed to the lemma retrieval stage in lexical access. The overall results show a semantic interference at early SOAs and a phonological one at later SOAs thus, indicating the existence of a two-stage model of lexical access in which semantic and phonological information is activated serially and independently.

Another study contributing to the serial view of lexical access is Wurm, Vakoch and Seaman (2004). Although focusing on speech perception, the researchers were able to demonstrate that the semantic aspects of lexical items seem to play a role in the recognition of spoken words. According to the authors, at the moment one recognizes a word, either visually or auditorily, he/she is already accessing its semantic characteristics.

In order to measure semantic effects on word recognition process, the authors utilized the Semantic Differential model (OSGOOD, 1969 in WURM et al, 2004), which consists of measuring the connotative meaning of words through bipolar scales composed by contrasting adjectives such as good and bad (the evaluation dimension), weak and strong (the potency dimension) and slow and fast (the activity dimension). Two experiments, with 65 and 46 participants each, were conducted. Experiment 1 was an auditory lexical decision task which consisted of distinguishing between real and pseudo-words. Participants received the stimuli over headphones and were required to respond to it as fast as possible. Reaction times were recorded for each stimulus. Results showed that words rated higher on Evaluation (good words), lower on Potency (weak words) and higher on Activity (fast words) were recognized more quickly.

In experiment 2, participants performed a naming task. They were asked to hear a word over headphones and repeat it into a micro-

phone as fast as possible. Reaction times were also recorded individually for each word. Results of the second experiment pointed towards a relationship between naming times and the Activity and Potency dimensions. That is, words rated higher on Activity (fast words) yielded faster reaction times whereas words rated higher on Potency (strong words) were associated with slower reaction times. The overall picture emerging from Wurm et al's study is that semantic features of a word make part of the recognition process since the beginning thus, reinforcing the two-stage model of lexical access.

On the other hand, some effort has been made so as to gather empirical evidence in favor of a cascade architecture in lexical access. The rationale behind these studies accounts for the fact that even unselected lexical nodes can spread activation to their phonological counterparts. In this sense, Morsella and Miozzo (2002) set out to investigate the relationship between semantic and phonological aspects of words in a variant of the Stroop paradigm – a picture-picture naming task. The complete stimulus set consisted of 152 composites of pictures in green and red comprising 19 phonologically-related words, 19 control words and 114 filler items. The paired pictures were presented one at a time and pictures were superimposed. Participants were instructed to name the green pictures of the composites (the target items) and disregard the red ones (the distractors) as quickly and accurately as possible.

Data analysis showed that the speakers in the experimental group responded to the pictures in the composites faster when they were phonologically related. As for the speakers in the control group, the paired pictures did not bear any phonological similarity. The phonological facilitatory effect between target items and distractors that appeared in the experimental group was not replicated thus, suggesting that word form features of non-spoken words do exert some influence on selected lexical items.

As could be seen in this section, the concern whether lexical access proceeds in two separate stages has permeated L1 lexical access research. Concerning the L2 field, the next section will show that studies on L2 lexical access have shifted the focus to whether there is simultaneously activation of L1 and L2 lexical items, and whether these items compete for selection when only one language is being spoken.

3. Current studies on L2 lexical access

One of the issues that still need to be solved in lexical access research concerning L2 speech production relates to the question whether, in the case of bilinguals, L1 and L2 lexical representations become simultaneously activated when just one language is being used. In order to examine a possible phonological activation (as a product of concurrent activation on lemma level) in the non-target language, Colomé (2001) carried out four experiments within the phoneme monitoring paradigm. The tasks consisted of the presentation of a drawing along with a phoneme and participants (Catalan-Spanish bilinguals) were asked to decide if this segment was part of the name of the depicted picture.

In the first experiment, phoneme presentation, represented by a letter, preceded the picture in 200 ms (SOA=-200). Results indicated that participants needed more time to reject the phonemes that belonged to the translations of either Catalan or Spanish words than when the phonemes did not belong to any picture name from the two languages. As explained by the researcher, these results may be a consequence of a common activation of concepts which, in turn, spread activation to L1 and L2 lemmas of the depicted pictures. This finding was interpreted as a support to the hypothesis that lexical activation in bilinguals is language-independent.

In addition, two more experiments were designed to ensure that the results were not influenced by the order of stimuli presentation neither by differences in the material used. The second and third experiments varied the time at which the phoneme was presented: 200 ms (SOA=+200) and 400 ms after the picture (SOA=+400), respectively. The procedures were the same used in the first experiment. Both experiments confirmed the results found in experiment 1.

Finally, the fourth experiment was run with monolingual Spanish speakers in order to rule out the possibility that participants might have adopted strategies that could bias task performance. If the effects presented in previous experiments were really due to concurrent lexical activation of both L1 and L2, then they would disappear in a monolingual condition. The prediction was confirmed, thus reinforcing the assumption that in bilinguals, once the to-be-expressed concept is determined, it spreads ac-

tivation to lexical items of the language in use and of the non-target language (the language-independent hypothesis).

Similarly, Lee and Williams (2001) conducted a study aiming at investigating whether words of an unwanted language compete with the words of the selected language during lemma retrieval in bilingual spoken word production. In their experiment, English-French bilinguals alternated between responding to a trio of definition stimuli and naming two pictures in a row. The definitions were presented and responded to in English, while the two pictures in a row could be named both in English or French or either one picture in English and the other one in French, being each combination as likely to occur. The picture response language was cued by a flag of the target language. The stimuli set consisted of 36 semantically related word pairs for the main experiment, 16 English words for the sub-experiment on repetition priming and 16 French words for the sub-experiment on cross-language repetition priming.

In sum, the authors concluded that bilingual word production entails cross-language lexical competition and that inhibitory mechanisms prevent the selection of words of the unwanted language. This account, according to the authors, corroborates Costa et al's (1999) claim that lexical selection is language-specific, but goes against evidence for the language-independent hypothesis found by Colomé (2001).

Contrary to Lee and Williams (2001), Roelofs (1998) argues that lemma selection occurs without inhibition in bilingual speakers. For Roelofs (1998), the lemmas in a bilingual mental lexicon need to be specified for language and are selected according to production-rules that refer both to the wanted and unwanted languages. Thus, the word production system in bilinguals would contain production rules of the kind: "<IF the concept is HOUSE (X) and the language is French, THEN select "maison">" (Roelofs, 1998, p. 95).

According Roelofs (1998), the production-rule mechanism could explain the fact that bilinguals are able to keep L1 and L2 separate in monolingual conversations, but still use them interchangeably if they want to and with a great retrieval speed. This is only possible, as claimed by Roelofs, because bilingual speakers do not need to inhibit one language in order to verbalize the other. Lemmas for both languages may be kept active, thus allowing for parallel retrieval.

Costa, Miozzo and Caramazza (1999), conducting several picture-name experiments with Catalan-Spanish bilinguals and word distractors paired according to the same language - Catalan-Catalan (i.e. taula-taula) or to different language – Catalan-Spanish (i.e. taula-mesa), found a facilitatory naming effect for the same-language condition. To explain this finding, Costa et al posit that lexical competition and selection occur within the target language, therefore excluding the possibility of a simultaneous activation of lexical items in the languages of a bilingual speaker.

A more recent study investigating lexical access and bilingualism was designed by Hirsh, Morrison, Gaset and Carnicer (2003). Their aim was first, to investigate whether lexical access in L2 for late bilinguals differed from L1 lexical access and second, to determine if age of acquisition affected lexical access of words acquired late in the lifespan of L2 speakers. Two experiments were run. In the first one, Spanish-English bilinguals were required to name 87 depicted pictures with an English word as fast as possible. After this task, half of the participants were asked to rate the age at which the pictures names in English were acquired following a 8-point scale: 1 to words acquired in the first year of leaning English; 7 to words learned in the seventh year and 8 to words which were not in their English vocabularies. The other half was then asked to rate the pictures' names according to how frequent these words were for each participant on a 8-point scale in which 1 corresponded to used/heard/read once a year, 7 to used/heard/read several times a day, and 8 to unknown words. In addition, another set of speakers from the same pool of participants rated the Spanish names of the pictures for age of acquisition in Spanish using a scale in which 1 referred to words acquired at the age of 2 or below, and 7 to words acquired at the age of 13 or above. Finally, a second analysis with monolingual speakers of English was conducted as a control experiment. Participants' task was the same of the other participants rating Spanish words according to their age of acquisition, except that the words were in English.

Through data analyses, Hirsh et al (2003) were able to show age acquisition effects on lexical retrieval in picture naming tasks for both L1 and L2 speakers regardless of whether the words were acquired before or after any critical period. The authors concluded that L2 speech performance may be influenced by the age at which one acquired/learned particular words in the target language. They further suggest that differences

in performance may be more related to the order in which specific lexical items were acquired rather than when they entered one's mental lexicon. However, it is worth acknowledging that the rating method used by Hirsh et al (2003) in order to investigate the effects of age on lexical access is vulnerable and not without criticisms. This is due to the fact that participants might have come up with information which they did not remember or were not sure about. The question whether one acquired a particular word in his/her first year learning English for instance, or after certain age seems difficult and complex to be determined, thus bringing serious implications as for the reliability of the data.

Although related to perception instead of production, Kandil and Jiang's (2004) study attempts to address whether lexical-semantic characteristics of words influence their recognition in different bilingual contexts (scripts). They investigated the role of script in visual word recognition by comparing the performance of two groups of bilinguals in lexical decision tasks in pure and mixed conditions: Arabic-English (different script languages) and English-French (same script languages) bilinguals.

Data collection included the presentation of a total of 256 stimuli -128 words and 128 non-words- to each participant, distributed in 3 presentation lists: a list of pure L1, a list of pure L2 and a list of mixed L1 and L2 stimuli. In pure language conditions, the lists comprised 64 stimuli (32 words and 32 non-words). In mixed lists, 128 stimuli were presented to participants (32 words and 32 non-words for both L1 and L2). In the stimulus set each word could occur in four possible contexts: 1) after a word from the same language, 2) after a non-word from the same language, 3) after a word from the other language and 4) after a non-word from the other language.

Results show the existence of language dominance in bilinguals, whether or not the two languages share the same script. There was also an interaction between language and script. Arabic-English bilinguals showed stronger effect of language dominance than the English-French group. An error analysis showed that subjects made more errors on L2 than on L1 trials and that English-French bilinguals made significantly more errors than Arabic-English bilinguals. There was also a significant interaction between language and script. A between-subjects analysis of reaction time scores (RTs) and error rates showed significant differences between the two groups. English-French bilinguals' RTs tended to be shorter than Arabic-English bilinguals. The most important result, according to the overall analysis, is that Arabic-English bilinguals also took significantly longer to respond to mixed-list items, suggesting that differences in script did not eliminate language switching costs.

The findings suggest that script plays a different role in bilingual word recognition in relation to the regular role played by language-specific orthographic cues when two languages share the same script. Another interesting finding was the significant difference in RTs and the error rate between the two groups of bilinguals. The fact that the English-French group was generally faster to respond to L1 and L2 words in pure and mixed conditions suggests that when the two languages share the same script, they reinforce each other and, therefore, processing will be faster for both. On the other hand, such a fast speed would be responsible for some accuracy trade-offs, which would explain why this group of bilinguals made more errors than the Arabic-English one.

The authors concluded that there is evidence that the difference in script cannot be treated as a simple language-specific orthographic cue and that more investigation on the issue using other paradigms are necessary. Kandil and Jiang (2004) also suggest the development of other models of visual word recognition to accommodate the role played by script.

4. Conclusion

In the present article, four main issues were in focus in our discussion of lexical access in speech production: (1) the decompositional and non-decompositional views on lexical access, (2) the cognitive mechanisms underlying the selection of lexical items, (3) mainstream research on L1 lexical access and, (4) L2 lexical access research.

Through out this discussion, an issue we found particularly intriguing and still a matter of great contention is the distinction between the non-decomposition and decomposition views of lexical access. The hyperonym rift seems to be the most problematic issue emerging from this debate. In this sense, we believe the best solution would be giving up compositionality by understanding the link between concepts and lemmas as an indirect relationship in which each concept pos-

sesses its concept node, which, in turn, will be connected to its specific lemma (ROELOFS, 1992).

Together with the compositionality problem, different cognitive mechanisms underlying word selection have been proposed – the Verbalizer model and the spreading activation theory of lexical access. The major point of discussion in both views concerns the map of thoughts or concepts into lemma representations. In our view, the constraints imposed by the chunking problem and the fact that the insertion of a new component in the system seems uneconomical to the speech production process makes the Verbalizer model lose its power.

As for research on L1 and L2 lexical access, it seems that the interests underlying studies in these areas somehow diverge. In the L1 field, on one hand, although researchers have gathered evidence in favor of a discrete (or serial) model of word production, there are also findings supporting the view of cascade models of lexical access. While the discrete model claims that activation flows in a unilateral fashion allowing phonological encoding to begin only after lemma selection processes have ended, thus postulating phonological activation only for the selected lemma; the cascade model posits that phonological activation can occur before lemma selection and non-selected lemmas can also spread activation to their phonological representations. On the other hand, L2 lexical access studies seem to be mainly concerned with the possible simultaneously activation of L1 and L2 lexical items, and whether lemmas from different languages compete for selection when only one language is being used.

Concluding, this brief review of literature aimed at discussing some relevant issues to the study of one of the core processes in speech production, named lexical access. Besides providing an overview on theories of lexical access and the cognitive mechanisms underlying the selection of words, this paper also had the objective to gather the scattering findings of lexical access research. This was done in order to provide an overall picture of lexical access processes, especially the ones regarding L2 lexical selection. It is hoped that this brief literature review will serve as a starting point for future studies, since L2 speech production processes have been much less investigated as compared to L1 processes.

ABSTRACT: Speaking involves conveying thoughts and concepts into words. To accomplish this process, speakers need to select, from their mental lexicon, the most appropriate lexical items to match their communicative intentions. This is what is often referred to as *lexical access*. According to several theories of speech production, there seems to be an agreement on the fact that lexical access involves two major stages: lemma retrieval and word-form encoding. In this paper, we focus on lemma retrieval and discuss (1) the two different views on the selection of lexical items – decompositional and non-decompositional, (2) the cognitive mechanisms underlying the selection of words, (3) mainstream research on L1 lexical access and, (4) current evidence of L2 lexical access research. The article is structured as follows. First, we give an overview of the general functional architecture of the speech production system. Second, we present the overall picture emerging from theories of lexical access, particularly the non-decompositional and the decompositional approaches and the cognitive mechanisms underlying lemma retrieval. Third, studies on L1 lexical access research are reported and discussed. Then, the main findings concerning lexical access in L2 are presented. Finally, based on the literature reviewed, we refer to some of the current intriguing issues regarding lexical access, more specifically, lemma retrieval.

KEY-WORDS: lexical access, lemma retrieval, speech production, cognitive mechanisms, mental lexicon.

5. REFERENCES

BIERWISCH, M., SCHREUDER, R. . From concepts to lexical items. *Cognition, 42*, 23-60, 1992.

BYGATE, M. Speaking. In CARTER, R & NUNAN, D. (Eds.) *The Cambridge Guide to Teaching English to Speakers of Other Languages.* Cambridge: Cambridge University Press, 2001.

CARAMAZZA, A. How many levels of processing are there in lexical access? *Cognitive Neuropsychology, 14,* 177-208, 1997.

COLOMÉ, A. Lexical activation in bilinguals' speech production: language-specific or language-independent? *Journal of Memory and Language, 45,* 721-736, 2001.

COSTA, A. COLOMÉ, A. CARAMAZZA, A. Lexical access in speech production: the bilingual case. *Psicológica, 21*, 403-437, 2000.

COSTA, A. MIOZZO, M. CARAMAZZA, A. Lexical selection in: do words in bilingual's two lexicons compete for selection? *Journal of Memory and Language, 41,* 365-397, 1999.

De BOT, K., SCHREUDER, R. Word Production and the Bilingual Lexicon. In SCHEREUDER, R.. & WELTEN, B. (Eds.) *The Bilingual lexicon.* Amsterdam: John Benjamins, 1993.

De BOT, K. A Bilingual Production Model: Levelt's 'Speaking' Model adapted. *Applied Linguistics, 13,*1, 1-24, 1992.

DELL, G. S. A spreading activation theory of retrieval in sentence production. *Psychological Review, 93,* 283-321, 1986.

DELL, G. S., CHANG, F., GRIFFIN, Z. M. Connectionist models of language production: lexical access and grammatical encoding. *Cognitive Science, 23,* 4, 517-542, 1999.

DELL, G. S., O'SEAGHDHA, P. G. Mediated and convergent lexical priming in language production: a comment on Levelt at al. *Psychological Review,, 98,* 604-614, 1991.

DELL, G. S., O'SEAGHDHA, P. G. Stages of lexical access in language production. *Cognition, 42*, 287-314, 1992.

DÖRNYEI, Z. & KORMOS, J. Problem-Solving Mechanisms in L2 Communication: A Psycholinguistic Perspective. *Studies in Second Language Acquisition*, *20*, 349-385, 1998.

GLASER, W. R. Picture Naming. *Cognition, 42*, 61-105, 1992.

GLASER, W. R., DÜNGELHOFF, F. J. The time course of picture-word interference. *Journal of Experimental Psychology: Human perception and Performance, 10*, 640-654.

HIRSH, K., CATRIONA, M., CARNICER, S. Age of acquisition and speech production in L2. *Bilingualism: Language and Cognition, 6,* 117-128, 2003.

KANDIL, M. A. JIANG, N. The role of script in bilingual lexical organization: evidence from switching cost. *Working Papers in Applied Linguistics, 1,* 1, 1-14, 2004.

LEE, M-W., WILLIAMS, J. N. Lexical access in spoken word production by bilinguals: evidence from semantic competition priming paradigm. *Bilingualism: Language and Cognition, 4,* 3, 233-248, 2001

LEVELT, W. J. M. . Speaking: from intention to articulation. Chapter 1, *The Speaker as Information Processor*. Cambridge, MA: MIT Press, 1989.

LEVELT, W. J. M. Accessing words in speech production: stages, processes and representations. *Cognition, 42*, 1-22, 1992.

LEVELT, W. J. M. Spoken word production: a theory of lexical access. *PNAS, 98*, 23, 13464-13471, 2001.

LEVELT, W. J. M., ROELOFS, A., MEYER, A. A theory of lexical access in speech production. *Behavioral and Brain Sciences, 22*, 1-75, 1999.

LEVELT, W. J. M., SCHRIEFERS, H., VORBERG, D., MEYER, A. S., PECHMANN, T.; HAVINGA, J. The time course of lexical access in speech production: a study of picture-naming. *Psychological Review,, 98*, 122-142, 1991a.

LEVELT, W. J. M., SCHRIEFERS, H., VORBERG, D., MEYER, A. S., PECHMANN, T.; HAVINGA, J. Normal and deviant lexical processing: a reply to Dell and O'Seaghdha. *Psychological Review,, 98*, 615-618, 1991b.

MORSELLA, E. MIOZZO, M. Evidence for a cascade model of lexical access in speech production. *Journal of Experimental Psychology: learning, memory and cognition*, *28*, 3, 555-563, 2002.

POULISSE, N. Language Production in Bilinguals. In DE GROOT, A. M. B. & KROLL, J. F. (Eds.) *Tutorials in bilingualism: psycholinguistic perspectives.* Mahwah, N. J.: LEA, 201-224, 1999.

POULISSE, N., BONGAERTS, T. First language use in second language production. *Applied Linguistics, 15*, 36-57, 1994.

ROELOFS, A. A spreading-activation theory of lemma retrieval in speaking. *Cognition, 42*, 107-142, 1992.

ROELOFS, A. Lemma selection without inhibition of languages in bilingual speakers. *Bilingualism: Language and Cognition 1*, 94-95, 1998.

SCHRIEFERS, H., MEYER, A. S., LEVELT, W. J. M.. Exploring the time course of lexical access in language production: picture-word interference studies. *Journal of Memory and Language, 29,* 86-102, 1990.

WURM, L., VAKICH, D., SEAMAN, S. Recognition of spoken words: semantic effects in lexical access. *Language and Speech, 47*, 175-204, 2004.

Notes

[1] According to Levelt (1989), lemmas are "entities containing the meaning of words".

[2] The Formulator (Formulador) is one of the components proposed by Levelt (1989) in his model of L1 speech production. According to him, it is in this component that the speaker formulates the grammatical and phonological characteristics of the

message. Levelt (1989) proposes that these features are stored in the speakers' mental lexicon and are triggered once the speaker accesses the relevant lemmas necessary to express the intended message.

[3] The Conceptualizer (Conceitualizador), as explained by Levelt (1989), is the component responsible for the generation of the to-be-expressed message. In this stage, the speaker generates a pre-verbal message, which is, in turn, sent to the next component of the model – the Formulator.

[4] WEAVER ++ (Word Encoding by Activation and Verification) is a computational model primarily developed by Roelofs (1992) to explain how speakers plan and control the production of speech, particularly their lexical choices.

[5] The SOA, or Stimulus Onset Asynchrony is a widely-used method in Psycholinguistic Research which allows researchers to investigate a facilitative or inhibitory influence of a stimulus on the latency of the response to another stimulus thus, providing information on internal mental processing (Glaser, 1992).