

THE ASYMMETRY IN BILINGUAL LEXICAL PROCESSING OF FORM SIMILAR WORDS

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Marija Vučinić

Faculty of Philology, University of Belgrade, Serbia

E-mail: vucinicmarija@yahoo.com

Abstract. *The main focus of this paper is to determine whether bilinguals selectively activate lexical representations in the target language, that is the language they are currently using, or they nonselectively access lexical representations in both languages, as well as to point out the factors influencing processing asymmetry.*

In the first part of the paper the organization of bilingual mental lexicon is discussed, while the other part of the paper is focused on the analysis and comparison of several experiments addressing the question of lexical processing asymmetry. On the basis of the obtained results (reaction time differences between bilingual and monolingual participants), I will draw the conclusions concerning factors which might influence processing asymmetry and try to find evidence favoring one of the two proposed accesses.

Key words: *bilinguals, lexical processing, asymmetry, word type*

THE ORGANIZATION OF THE BILINGUAL LEXICON- THE UNITARY OR DUAL LANGUAGE SYSTEM HYPOTHESIS?

Studies of bilingual language acquisition are generally focused on the organization of mental lexicon examining whether bilinguals have one or two separate language systems. According to the unitary language system hypothesis (Geneese & Nicoladis 2006: 328) bilinguals have one, undifferentiated language system which is not identical to the language organization in monolinguals.

Volterra and Taeschner (1978: 312) give the most explicit formulation of this hypothesis discerning three phases of development: "In the first stage the child has one lexical system which includes words from both languages. ..., in this stage the language development of the bilingual child seems to be like the language development of the monolingual child. ...In the second stage, the child distinguishes two different lexicons, but applies the same syntactic rules to both languages. In the third stage the child speaks two languages differentiated both in lexicon and syntax..."

Speaking of the unitary language system hypothesis we may ask how many common features two languages need to possess in order to make a unitary system. Diller (1974, after Kangas 1981: 123) believes that there are no two languages grammatically and lexically so similar to make a unitary system, while Kangas (1981: 246) states that bilinguals practically have one grammar system and two separate lexicons because grammatical and phonetic structures become identical in later phases of development.

Studies report that bilinguals produce their first words at 12-13 months (Geneese & Nicoladis 2006: 342), at about the same age as monolingual children. Bilingual children's lexical acquisition is led by the principle of mutual exclusivity or the assumption that new words refer to new referents. Therefore we conclude that the acquisition of translation equivalents in bilinguals violates the principle of mutual exclusivity which means that these children have two distinct lexical systems. It has also been noticed (Geneese & Nicoladis 2006: 331) that young bilinguals tend to transfer syntactic patterns of their more proficient language to the non-dominant language, as well as to mix function words from their more proficient language with functionally less important words from their less proficient language, and never the reverse. This finding is in line with Kangas' hypothesis according to which there is one grammatical and two lexical systems.

BILINGUAL MENTAL LEXICON-THE ASYMMETRY IN BILINGUAL LEXICAL PROCESSING

Bilingual mental lexicon is composed of two levels of processing: the conceptual and the lexical level. At the conceptual level conceptual information is stored in one common conceptual store, regardless of the language of input. This common conceptual store is connected to the L1 and L2 lexical stores, which are also connected with each other. This model of bilingual mental lexicon is referred to as hierarchical. Researchers (Centowska, 2006; Kroll, 1993; De Groot & Comijs, 1995) generally agree that the selection of the processing route depends on the direction of processing, forward or backward processing (from L1 to L2 or vice versa).

The asymmetrical model of bilingual mental lexicon (Table 1) points out the importance of the strength of L1 and L2 connections. According to this model L2 connection is weaker since the second language is usually acquired later in life, but it becomes stronger due to frequent use so that the difference in the strength of the two connections gradually disappears and in that case we talk about balanced bilinguals.

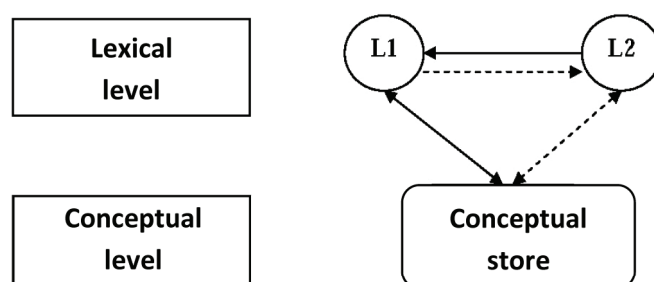


Table 1 Asymmetrical model (from Kroll 1993: 69)

In the experiment with German-English bilinguals Kroll and Sholl (1992: 25) conclude that reaction times are longer when the task requires the activation of the conceptual connections (picture naming task), and shorter during translation from L2 to L1, due to the activation of only lexical connections. The results of the picture naming task show that semantically classified words influence in a more direct way forward translation, from L1 to L2, which is based on the conceptual access, while there is no such effect on backward processing. We may suppose that the results obtained in the experiment conducted by Kroll and Sholl generally refer to beginner bilinguals and they are explainable by learning methods and strategies, since new vocabulary is usually acquired by repeating translation equivalents, which mainly doesn't require the activation of the conceptual connections, but makes stronger L1 and L2 lexical connections. Unlike beginner bilinguals, lexical processing of proficient bilinguals is more conceptually defined.

According to the decompositional model, the meaning of the word is a set of different semantic features forming the semantic representation of that word in the conceptual store. Concrete words will share more semantic features than abstract words and therefore are easier to process (De Groot 1993: 38). Proficient bilinguals who know more shades of meaning of a word and are able to determine the degree of overlap of meanings will easily process even abstract words. This means that processing is determined by the level of language proficiency, rather than by the mere organizational structure of the mental lexicon. Therefore, we suppose that beginners generally rely on "non-semantic features" (phonological features, form similarity) while proficient bilinguals tend to make use of more complex associations and conceptual information.

It may be noticed that in the previously discussed experiments the differences in language reception and production are generally ignored. On the basis of the hierarchical model and its subtypes (asymmetrical and decompositional model) we might conclude that reception and information storing function as one system, while the language production process resembles two coordinate systems. Still, if we think of persons who learned their second language later in life, we may notice the opposite process: two distinct systems during reception and information storing and one combined system in language production. These bilinguals often transfer characteristics of one language to the other, such as pronunciation, phonetic and phonological features.

LEXICAL PROCESSING ASYMMETRY AS THE RESULT OF FORM OR SEMANTIC SIMILARITY?

Word type is often referred to as one of the factors causing asymmetry in lexical processing. In the 1980's De Groot and Comijs (1995, after Centowska 2006: 13) introduced a few variables for distinguishing different word types: frequency, cognateness¹, definition accuracy, familiarity, context availability. The results of their experiments show that cognates are processed faster or that reaction times were longer for abstract words. The reaction times can be explained by activating conceptual/lexical routes, while the activation of conceptual routes during the processing of abstract words slows down the reaction time.

¹Cognates are words which are phonologically and/or orthographically similar translation equivalents.

Since a decompositional model of bilingual mental lexicon clearly states the difference between semantic and lexical processing and the asymmetry is also dependent on word type, first of all I will go through the experiment conducted by Christina Schelletter (2002) who addresses the question whether bilingual children use form similarity as a strategy for a faster acquisition of nouns and verbs.

Starting from the hypothesis that some word types are processed faster, Schelletter (2002: 6-13), adopting a criterion that requires 50% or more of the phonemes making up the word and its translation equivalent to be similar, divided the items in 3 groups: identical, form-similar and non-similar items. The results of the first experiment examining the development of German-English bilinguals from the age of 1;11 to 2;9 show that the frequency of occurrence of a word class depends on the context and the age of children. Reaction times measurement in the experiment including 7-10 year old children showed that identical and form-similar nouns were translated faster, while the same effect wasn't observed for verbs. We should take into consideration context differences in which the examined verbs might be used and the fact that there is only partial overlap between semantic features which could be proved by componential analysis (for example the English verb *make* and the German verb *machen*). These results lead us to the conclusion that children make use of form similarity for connecting a word with its translation equivalent in an early period of noun acquisition, while the acquisition of verbs is more grammatically defined.

It can be observed that this experiment generally ignores the semantic factor while focusing on form similarity. Considering the fact that only concrete words were used in the experiment (*grass, shoe, tiger, ball...*) the validity of results should be put to test in the experiment including abstract words which have a broader range of meanings and are more tied to the context so that the reaction time wouldn't depend specifically on the form similarity between a word and its translation equivalent.

PROCESSING OF COGNATES-LANGUAGE FACTOR AND THE WORD FREQUENCY EFFECT

Many hypotheses regarding the structure of the mental lexicon that have been proposed so far are based on the cognate facilitation effect. Supposing that form similarity proposed by Schelletter can't be the only factor causing the facilitation effect, I will try to identify the factors which might influence lexical processing and point out their significance by a comparison of different studies addressing this question.

Examining the cognate facilitation effect in Russian-English bilingual speech processing, Marina Sherkina- Lieber (2004) notices the cognate facilitation effect and concludes that cognates might have shared representation in the bilingual lexicon. In the experiment with 40 Russian-English bilinguals and 20 English monolinguals, Lieber tests the hypothesis that CFE² depends on the frequency of a cognate in the non-selected language, comparing perception of word frequency in bilinguals and monolinguals. The participants were asked to rate the frequency of a given word on a 1 to 10 scale. There were two variables during the analysis: language (bilingual/monolingual) and word type (cognate/non-cognate). The results showed that bilinguals rated the frequency of cognates higher than monolinguals, but there was no significant difference between bilinguals' and

² CFE- Cognate Facilitation Effect

monolinguals' ratings for non-cognates. A high correlation level between bilingual and monolingual ratings and not so high, but still significant, correlation between rated frequencies and dictionary frequencies mean that these results could be considered a valid source of information. Differences between rated frequencies and dictionary frequencies can be explained by the fact that frequency dictionaries are based mainly on written corpora and participants' rating on spoken language. Significant differences between bilingual and monolingual frequency ratings of cognates unlike non-cognates (4,61: 0,4%) mean that the facilitation effect is observed during the processing of words which have shared representations, not only at the conceptual level, but also at the level of form. If we suppose that the chosen concept activates identical or similar orthographic forms in both languages, in cognate processing the same form will be activated twice, which consequently speeds up and facilitates processing and selection. This fact supports the hypothesis according to which there are one conceptual and two separate lexical stores, but it remains unclear if frequency effect could be considered the basic factor underlying the cognate facilitation effect or it is mainly defined by the language of processing.

The basic question to be examined in two experiments conducted by Beauvillain and Grainger (1987) concerns whether and to what extent the processing of interlexical homographs is determined by language. Forty English-French bilinguals participating in the experiment were supposed to read letter strings presented on the screen and decide whether it was an English word. They were instructed to read these homographs, embedded in a list of French non-homograph words, before performing a lexical decision task on English test words related or unrelated to the English meaning of the homograph. Thirty interlexical homographs were selected so that each word (of the same graphemic form) had two readings (English and French), but their meanings were semantically distinct. Words were presented at a different time distance between stimulus and target word (150 and 750 ms). The results of the experiment demonstrate the presence of the facilitation effect at 150 ms for identification of the target words related to the meaning of the homograph in the non-selected language, while the same effect is not observed at 750 ms. These results suggest that language context doesn't initially block access to the reading of homographs in the non-selected language which means that initial processing is language non-selective. Since at 750 ms an insignificant inhibitory effect was observed (only 7 ms), we cannot state that in later stages processing becomes language-selective, as indicated by the results of the experiment conducted by Gerard (after Scarborough et al. 1984).

In the experiment with English-Spanish bilinguals in which homographs of different frequency were used, Gerard found that processing of unbalanced homographs was affected by the language context rather than frequency-lexical decision time to RED, which is a low-frequency word in Spanish but a high-frequency word in English. The reaction was faster when the language of the context was English than when the language of the list was Spanish, where reaction times were similar to other Spanish words of the same frequency. This experiment is consistent with the language-selective access according to which a homograph is a positive stimulus only for words in the same language contexts independently of the frequency.

It is the frequency effect that was examined in the second experiment conducted by Beauvillain and Grainger (1987) who were looking for additional evidence for the non-selective access in the initial stage of processing. The results of the experiment with unbalanced homographs show that there was 26.15% facilitation effect for the higher frequency reading homograph in the appropriate language mode and 6.59% in the inappro-

priate language mode, while the same effect was insignificant in both contexts for the lower frequency homograph (0.31 and 0.11%). The results indicate that it is frequency rather than language that determines the lexical access during processing.

Considering these results and supposing that the interaction between the two lexicons of bilinguals is determined also by orthographic form, we may assume that a selective access might occur if the specific orthographic form of the stimulus directs lexical search to the appropriate language. It is still not clear in these experiments how phonological information influences the processing. It is possible that at initial stages orthographic information extracted from the input is sufficient to permit recognition even before the phonological access is activated. It could be activated in the later stages of selection of the appropriate reading of the homographs. It is also unclear whether the alternative reading of the homograph is initially blocked, or only delayed. We may assume that there was too large a difference in frequency between the two readings which blocked the access to the lower frequency homograph in the experiments described above. In any case, both meanings of the homograph are available to the processing in the way that is independent of the selected language.

CONTEXT EFFECT DURING PROCESSING OF COGNATES

In the above-described experiments the effects of language and frequency were examined, while the effect of sentential context was mainly ignored and the experimental conditions were generally constraining since the participants were given the lists or pairs of words out of context, which is not a natural way of language use and processing. Therefore, I chose the next two experiments (the first with bilinguals, and the other with monolinguals) primarily because of the more natural experimental condition with words being observed in the sentential context.

BILINGUAL STUDIES

The focus of the experiments conducted by Conklin and Gail Mauner (2005) is whether readers and hearers access one or both meanings of a homograph when it appears in the sentential context which is biased toward one meaning.

The participants read English and French sentences that end in an interlingual homograph and then make a lexical decision to a test word that is semantically related to the meaning of the sentence-final homograph in the non-target language. Test words that are semantically unrelated to their context sentences are used as control words.

If lexical access is nonselective, reaction time to target words should be significantly different depending on the fact whether probe words are semantically related or unrelated to the their sentential context. If lexical access is language selective, the French word COIN ("coin" meaning "corner" in French) won't represent a positive stimulus for the English word MONEY, and lexical decision times to MONEY and a control word shouldn't differ.

The results showed that, regardless of language, word decisions were faster than non-word decisions, and decision times to words following homographs were slower than those to words following non-homographs, but only when the language of the sentence was French (L2).

Before this experiment, participants were given a sentence recognition test containing 10 sentences, 5 of which had already appeared in the online experiment; of the 5 that hadn't appeared 2 sentences contained the other member of the homograph sentence pair which was semantically very different from the sentence that had appeared in the online experiment. Participants were asked to indicate whether any of the 10 sentences had appeared in the online experiment, in the same language or translated. All participants falsely believed that they had seen at least one of the two sentences containing the homograph in the online experiment. This leads us to the conclusion that they reconstructed the sentences on the basis of conceptual information associated with the lexical input, regardless of the language.

Despite the initial hypothesis according to which the sentential context might constrain the processing of homographs to the language appropriate meaning, the results of the experiment indicate that the semantically constraining sentential context doesn't restrict the interpretation of homographs. Longer decision times to homographs than non-homographs support the hypothesis that bilingual lexical access is language non-selective. Since the results of the sentence recognition task pointed out the importance of the conceptual information of the lexical item rather than the language of the sentence, we may suggest that this finding is not consistent with the hypothesis according to which language mode determines processing route. If we compare described experiments to similar ones conducted with monolinguals, we may find different results.

MONOLINGUAL STUDIES

In one of monolingual studies conducted by Tanenhaus, Leiman and Seidenberg (1979) reaction time measurement was used to investigate the context effect in the processing of ambiguous words-noun-verb pairs (*He cut the roll. They began to roll.*). It should be pointed out that target words related to either noun or verb reading were presented at different times (0, 200 and 600 ms) following the sentence-final ambiguous words. There were four sentences constructed for each word: one assigned a noun reading to the ambiguous word, the other a verb reading and two additional control sentences.

The results showed that at 0 ms there was facilitation effect, regardless of the biasing context. At 200 ms facilitation was observed only when the target word was related to the contextually appropriate meaning of the ambiguous word, while at 600 ms there was only a minimal effect of context and it depended on the fact whether the target word was a noun or a verb. Considering the drop in facilitation between 0 and 200 ms, we may conclude that all readings of ambiguous words are initially accessed and inappropriate semantic features are suppressed later during the selection phase.

It is interesting to notice that there was no inhibitory effect in comparison to the control group, and we may have supposed a slower reaction in case of non-selective access, which in our case would have been at 0 ms. Regardless of the obtained effects, the results confirm the non-selective hypothesis in both cases, with interlingual as well as with intralingual homographs.

SELECTIVE ACCESS-SUFFICIENTLY CONSTRAINING CONTEXT

One of the experiments which gives evidence for selective access is the study of Tabossi (Tabossi et al. 1987, after Simpson 1994) who believes that selective access may occur if the context is sufficiently constraining. She found that sentences biased toward the dominant meaning led to the activation of that meaning only, provided that the context highlighted a salient feature of that meaning, which leads us to the conclusion that the role of the context is secondary.

The violent hurricane did not damage the ships which were in the port, one of the best equipped along the coast (Simpson 1994:368).

This sentence points out the salient feature of a port, which is a safe place for ships.

Different results obtained for context effect shouldn't be surprising if we take into consideration the fact that there are no precise criteria for defining context appropriateness. In any case, the context has to activate some information in order to constrain the access to the appropriate meaning, and therefore we may consider it sufficiently constraining if it highlights salient features of one of the possible meanings, resulting in the overlapping of features of homographs and those represented by the target word. Nevertheless, if we return to the experiment conducted by Tabossi (1987, after Simpson 1994:369) in which one group of participants gave association to ambiguous words in biasing sentence context (*The boy dropped the plant*), while the other gave association to the word given in isolation, we may conclude that the traditional definition of context as the meaning conveyed within a single sentence, must be expanded. The role of context cannot be reduced to the simple activation of the lexical item semantically similar to a given homograph. Besides *leaves*, which was a frequently produced associate to *plant*, another response was *spill*, which is closer to the meaning of the whole sentence than to the meaning of the homograph.

We might conclude that the homograph and its context activate a range of features that will overlap with features represented by the target, affecting in that way the processing direction. It is also possible that higher frequency meaning will be activated in all contexts, and that the selection of the appropriate meaning will be facilitated by the narrowly defined and constrained context.

CONCLUSION

Starting from the results of Christine Schellletter, according to which processing was facilitated by form similarity, by comparison of four similar studies, I have tried to discover other factors influencing processing and point out their significance.

On the basis of the perceived frequency facilitation effect in the processing of homographs, which is explained by a simultaneous activation of the same information from two sources, we conclude that the role of the language of processing is secondary in comparison to the frequency effect and the conceptual information associated to the lexical item, which is in line with the one language system hypothesis.

Examining the role of context we have noticed the importance of the interaction of temporal and contextual factors, taking into consideration the drop in facilitation effect in later phases of processing. Therefore, we conclude that there is an initial simultaneous,

non-selective access to all meanings, but it is affected by frequency and contextual factors. We have to keep in mind that different tasks and procedures for creating stimuli strongly affect our performance, which means that we might be able to understand the nature of lexical processing only by expanding our view of context and its influence.

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ASIMETRIJA PRILIKOM PROCESIRANJA REČI SLIČNOG OBLIKA KOD BILINGVALNIH GOVORNIKA

Marija Vučinić

Osnovno pitanje koje se postavlja u ovom radu je da li bilingvalni govornici prilikom leksičke obrade informacija neselektivno pristupaju integrisanom leksikonu, ili je pak reč o odvojenim leksikonima kojima se pristupa selektivno, u zavisnosti od trenutno dominantnog jezika.

U prvom delu rada su predstavljeni različiti modeli mentalnog leksikona bilingvala, dok će u drugom delu rada, na osnovu (ne)postojećih razlika u reakcionom vremenu u odnosu na kontrolnu grupu, koju najčešće čine monolingvalni govornici (pri čemu je moguć inhibitorni ili olakšavajući efekat u kontroli aktivacije ciljnog jezika) biti izvedeni zaključci o faktorima koji mogu dovesti do asimetrije u leksičkoj obradi informacija, kao i opšti zaključak o vrsti pristupa leksikonu bilingvalnih govornika.

Ključne reči: bilingvali, leksičko procesuiranje, asimetrija, tip reči