UDC 81'246.2
Original scientific paper
Received on 31 October 2012
Accepted for publication on 9 May 2013

Differences in Lexical Access Efficiency in Croatian-English Bilinguals

Irena Zovko Dinković
Tena Šojer
Faculty of Humanities and Social Sciences
University of Zagreb
izovko@ffzg.hr
tenasojer@gmail.com

Studies to date have shown that both bilingual adults and bilingual children score lower than their monolingual peers on standardized productive and receptive vocabulary measures. Since there is no significant difference in the size of the conceptual vocabulary between these groups, such results imply a more effortful lexical access in bilingual speakers. Several models[1] have been constructed in attempts to explain these discrepancies, focusing on spreading activation and selection mechanisms in lexical access. There is, however, no conclusive evidence supporting either one of the models, and there are no studies which test for differences in performance of simultaneous and sequential bilingual speakers. We therefore tested the efficiency of lexical access in Croatian-English simultaneous and sequential bilinguals, using a picture vocabulary test, in order to determine whether there is a significant difference in receptive vocabulary performance between these two groups and in comparison to their monolingual peers.

1. Theoretical background

Defining bilingualism seems fairly simple at first glance and it is often described as "knowing" two languages (Valdes/Figueroa 1994; Gottardo/Grant 2008). This straightforward description may serve to satisfy a layman's curiosity, but for linguists and researchers, it only raises more questions.

The first problem arises in defining what it really means to "know" a language. Language competence implies mastery of four language abilities: listening, speaking, reading and writing. These abilities can be divided along

[1] For example, the *Competition for Selection Model* (Starreveld/La Heij 1996; La Heij 2005; Green 1998), the *Language-Specific Selection Mechanism Model* (Costa/Santesteban, 2004; Costa/La Heij/Navarrete 2006), the *Language-Specific Treshold Model* (Finkbeiner/Gollan/Caramazza 2006; Finkbeiner/Almeida/Janssen/Caramazza 2006), the *Frequency Model* (Gollan/Acenas 2004; Gollan/Montoya/Werner 2002), etc.

two lines and classified either as receptive and productive abilities, or as oracy and literacy. A bilingual person may be highly proficient in some of these skills, yet lack competence in others - for example, understand written or spoken language quite well, but have difficulty in its production, as is the case with passive bilinguals. These four language abilities can also be subdivided into numerous "skills within skills", such as pronunciation, grammaticality, extent of vocabulary, variations of style, social competence in language use, etc. (cf. Baker 2011), making the problem even harder to tackle.

Even if all these factors are taken into account, it is practically impossible to define what level of competence it takes to make a person bilingual. Bloomfield (1935) very narrowly defined bilingualism as "native-like control of two languages", assuming that a speaker must reach a certain "degree of perfection" in their second language in order to be called a bilingual. This definition is even more vague if we take into consideration the fact that *native-like* is quite a relative term. It can hardly be assumed that all native speakers share the same level of linguistic competence, let alone that they reach linguistic perfection in their mother tongue. And yet, by no means are those who fail to reach the aforesaid (but not clearly defined) degree of linguistic competence stripped of their rightful title of native speakers. Even Bloomfield (1935) finally concluded that this native-like control or "degree of perfection" at which a speaker becomes bilingual cannot be clearly defined, yet offered no alternative or guidelines.

However, the idea of native-like as discriminant has not been entirely abandoned in linguistics. One stream considers speakers with comparable, native-like mastery of both languages the only "true bilinguals" (Baker 2011), and hence the only appropriate subjects for research on bilingualism. In some works the term *true bilinguals* is replaced by terms such as *balanced bilinguals*, *ambilinguals* or *equilinguals,* which do not have such a discriminatory ring to them, but are nevertheless based on the same assumption. Others, however, point out that such speakers are "a rare, if not non-existent species" and nothing more than an idealized concept, since hardly anyone is equally competent in two languages across all situations (Baker 2011). Since the two languages are usually acquired in different ways and different social and linguistic situations, and possibly used to different extent as well, it is only natural that the competence and ease of use will vary.

Most bilinguals thus have (slightly or notably) stronger skills in one language, which is considered to be their dominant language. The dominant language, however, is not necessarily the mother tongue. Although the first language (mother tongue or L1) can start as a dominant language, this can change over time, due to increased use of the second language (L2) or any other circumstance. It is also possible to show language dominance in one language for one domain and in the other language for another domain, especially in bilingual diglossic situations[2].

[2] Diglossia is a term which denotes a relatively stable language situation in which, in addition to the primary dialects of the language (which may include a standard or regional standards), there is a very divergent, highly codified (often grammatically more complex) superposed variety, the vehicle of a large and respected body of written literature, either of an earlier period or in another speech community, which is learned

Bilingual speakers also differ by the age at which they acquire or learn their second language, and can be classified as simultaneous or sequential bilinguals accordingly. In the strictest sense of the term, simultaneous bilingualism occurs when the acquisition of both languages starts simultaneously prior to one year of age (De Houwer 2005). This implies that a child is reared in a bilingual environment and exposed to both languages during infancy. Simultaneous bilingualism, nevertheless, should not be mistaken for balanced bilingualism. Even parallel language acquisition is not a guarantee of equivalent language ability because different experiences will result in different language development (cf. Baker 2011).

A much more common type of bilingualism - sequential bilingualism - occurs when the acquisition of the second language starts later than first language acquisition, i.e. when literacy in L1 has already been established. The way in which the second language is learned can differ greatly, depending on the age at which it started. Latest research has shown that brain organization is different for L2 acquisition after 5 years of age (the so-called critical period) and no longer results in native-like organization for language (De Houwer 2005). This does not imply that the mastery of second language cannot be comparable to or even better than the mastery of the mother tongue, but it should be taken into consideration in comparative research of the two groups. Linguistic mechanisms underlying language production and reception are not entirely clear or agreed upon, and the organization of language in the mind might prove to play a significant role.

When all the variables are taken into account – the circumstances and manner of acquisition, the age of the speaker, exposure to the languages, individual linguistic competence, language dominance, etc. – it becomes clear that bilingualism is a very diverse phenomenon. It is safe to suggest that the effects it produces can vary greatly, which is why this study focuses on the differences in lexical access between simultaneous and sequential bilinguals, taking into consideration different variables stated above.

1.1. Effects of bilingualism on vocabulary

Regardless of the circumstances in which they were acquired, the two languages coexisting in a single mind must interact in some way. However, it is still unclear whether (or to what extent) languages assist one another or interfere with each other in their daily use. In general, different language skills are proving to be differently affected by bilingualism.

Vocabulary skills are the first and foremost step in language acquisition (Kroll/De Grott 2005) and form the very foundation of linguistic and cognitive functioning as they influence morpho-syntactic ability, reasoning skills, metalinguistic capacity and literacy acquisition (Baker 2011). Seeing that

largely by formal education and is used for most written and formal spoken purposes but is not used by any section of the community for ordinary conversation (Ferguson 1964).

vocabulary development may initially be delayed in bilinguals, it is often assumed that vocabulary skills are somewhat negatively affected by the acquisition of two languages (Gottardo/Grant 2008). A late start, nevertheless, does not imply weaker overall vocabulary competence. Research shows that bilingual children do not, in fact, lag behind their monolingual peers in the scope of their vocabulary and conceptual development. Numerous standardized vocabulary tests showed comparable results in monolingual and bilingual children (Bialystok/Craik/Klein/Viswanathan 2004; Kaushanskaya/Marian 2009), and studies focusing on latent vocabulary knowledge (conceptual vocabulary) in both bilingual and monolingual children and adults show no significant difference (De Houwer 2009; Kaushanskaya/Blumenfeld/Marian 2011).

Whereas the size of vocabulary proves to be comparable, lexical performance tends to differ. Results obtained in several studies imply that bilinguals have lower receptive and expressive vocabulary performance than their monolingual peers. When tested in their second language, bilingual participants generally scored lower on vocabulary measures than their monolingual peers (cf. Kohnert/Hernandez/Bates 1998; Roberts/Garcia/Desrochers/Hernandez 2002). This might not seem surprising, seeing that the learning of the second language often starts at a later age and involves different linguistic and social circumstances. However, several studies showed that bilingual children also scored lower on vocabulary measures than monolingual children when tested in their dominant language (cf. Ben-Zeev 1977; Paez/Rinaldi 2006; Pearson/Fernandez/Oller 1993; Windsor/Kohnert 2004).

If the size of vocabulary is comparable, the reason for such discrepancies between vocabulary performance of mono- and bilingual speakers must lie in the mechanisms of access to the mental lexicon, rather than in the lexicon itself. Tests based on the efficiency of lexical access such as picture naming and semantic-fluency tasks confirm this theory, showing significant differences in test results of monolingual and bilingual participants (Bialystok/Craik/Luk 2008; Gollan/Montoya/Werner 2002). These patterns have been noted in adults and children alike, and they might suggest that bilingual speakers have a slightly more effortful lexical access. However, there is no conclusive evidence which would indicate whether there is a significant difference in the efficiency of lexical access in simultaneous and sequential bilinguals.

1.2. Lexical Access

Lexical access is by no means a simple straightforward process. It functions on several levels and involves complicated and not entirely investigated mechanisms, and yet the duration of the whole process can be measured in milliseconds. It is easiest described through a simple picture naming task, which is a simplified version of the process, but highly representative of its stages.

If a participant is shown a picture of a dog, for example, the lexical response "dog" would seem virtually instant, but according to Levelt (1989) and Costa/La Heij/Navarrete (2006), this information had to pass through at least three stages

or *layers of representation* in order to be said: the conceptual, the lexical and the phonological layer. The conceptual layer is the first and foremost in an attempt to verbalize and vocalize an idea. The picture of a dog thus triggers a mental image or a concept of a dog. This is called activation of the conceptual node or representation. Through the process of spreading activation, introduced by Collins/Loftus (1975), activation of the conceptual node spreads or extends to the corresponding lexical node and from there to the phonological node, resulting in the vocal response "dog".

However, this process does not happen so smoothly in practice. The activation of the conceptual node does not only spread to the next layer of representation, but it also activates other nodes to which it is semantically linked (Costa/La Heij/Navarrete 2006). There are two models attempting to account for this sort of spreading activation. One model suggests that the conceptual nodes are indivisible units (Levelt 1989; Roelofs 1992). According to this model, a node corresponding to the picture (DOG) somewhat spreads activation to other (indivisible) semantic representations connected to it simply because they are associated with it due to extralinguistic knowledge (for example, nodes such as CAT, WOLF, etc). According to the other model, conceptual nodes are really bundles of distinctive semantic features (Caramazza 1997; Dell 1986) – in other words, a conceptual node DOG encompasses a bundle of semantic features such as *animal, four legs, tail, wags, barks*, etc. The activation of this node would in turn activate a conceptual node CAT, for example, because they have some semantic features in common – eg. *animal, four legs, tail* (see Fig. 1).

Regardless of which model of conceptual activation is at work, it is assumed that spreading activation always penetrates the lexical layer as well, activating conceptually related lexemes (Finkbeiner/Gollan/Caramazza 2006). If spreading activation penetrates the phonological layer, spontaneous speech errors or "slips of the tongue" occur.

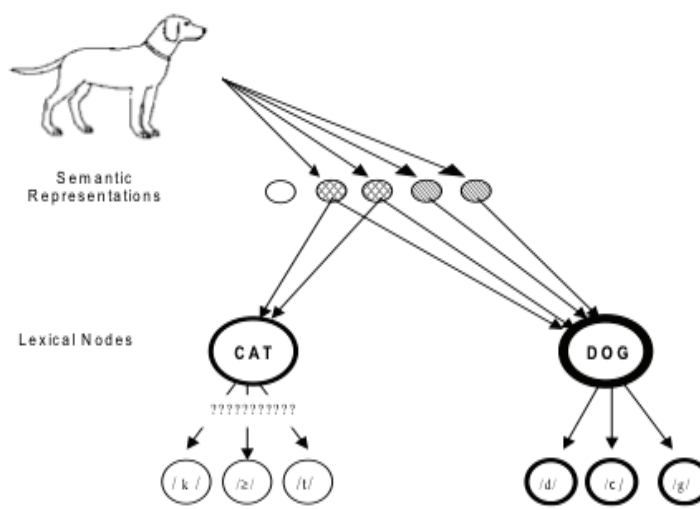


Figure 1. Illustration of lexical access (Costa/Colomé/Caramazza 2000)

Because of the spreading activation phenomenon, it is assumed that there must be some sort of selection mechanism enabling the mind to choose the most fitting of the activated nodes. The selection of a lexical node thus depends on its own activation level on one hand, and the activation level of competing lexical nodes on the other, which is described as the Luce ratio[3]. This would imply that as the difference between the activation levels of target and non-target lexical nodes decreases, the selection becomes more effortful and hence lasts longer. This is referred to as the *hard problem* (Finkbeiner/Gollan/Caramazza 2006). It should be noted that the *hard problem* does not in fact present a difficulty to bilinguals – for proficient bilinguals, speaking in one language or the other is effortless (Finkbeiner/Gollan/Caramazza 2006) and reduced vocabulary performance of bilinguals is noticeable only when lexical retrieval is measured via time-limited tasks, or tests measuring the speed of retrieval (Kaushanskaya/Blumenfeld/Marian 2011).

The process of lexical access in language reception can be presumed to resemble the process of language production in reverse. The phonological layer is activated first, the activation proceeding quickly to the lexical and then the conceptual layer, with some side spreading along the way. This process is extremely fast, considering that an average speaking rate is three or four words per second, which can be exceeded significantly without hindering the listener's comprehension (Wurm et al. 2003). According to some models, the whole process of lexical and semantic acquisition starts after the first 150 or so milliseconds of acoustic input (Marslen-Wilson 1987; McClelland/Elman 1986; Luce/Pisoni/Goldinger 1990).

Since no study makes a distinction between simultaneous and sequential bilinguals, we decided to conduct an experiment which would test not only the efficiency of lexical access in monolinguals and bilinguals, but also in simultaneous and sequential bilinguals. We expected to find considerable discrepancies in performance between the latter two groups, because of the differences in simultaneous and sequential acquisition of two languages, which are bound to influence the results.

2. Method

2.1. Participants

The test was administered to two test groups, Croatian-English simultaneous bilinguals and Croatian-English sequential bilinguals, and two control groups, Croatian monolingual group and English monolingual group.

40 participants overall were recruited for the experiment, 10 participants for each test and control group[4]. All the participants were adults, from 18 to 56 years

[3] The Luce ratio states that there is an inverse relationship between the time required to select a target lexical node and the relative activation levels of competing lexical nodes (Finkbeiner/Gollan/Caramazza 2006)

[4] Since this is a small-scale study, the overall number of participants, as well as the number of participants in each group, may be considered insufficient for making general and universally valid claims about the studied phenomenon. However, the obtained results are still quite indicative as to the model which seems most appropriate to accomodate the claims in this paper, and may well serve to indicate the direction of future studies.

of age and either had a higher education degree or were enrolled in an institution of higher education.

In the simultaneous bilingual test group, the participants acquired their languages simultaneously and were raised in bilingual homes. The sequential bilingual test group was comprised of participants who began to learn English as their second language at various ages, ranging from 3 years of age to 18 years of age. All the participants in the test groups reported speaking both English and Croatian with a high degree of proficiency (based on self-evaluation) and on a regular basis. Since the *Frequency Model* (Gollan/Acenas 2004; Gollan/Montoya/Werner 2002) suggests that bilingualism in general reduces the frequency of use of any item in the lexicon of a bilingual speaker, which in turn results in the reduction of functional frequency and may be regarded as the reason for slower lexical access, we included this parameter as relevant when it comes to sequential bilinguals. The participants in this group were therefore asked to assess their own daily frequency of use of the language they consider to be their L2.

2.2. Picture vocabulary tests

The goal of the present research was to test for differences in the efficiency of lexical access and receptive vocabulary skills in Croatian-English bilingual speakers. Two tests were devised for this purpose – one in English and one in Croatian. The tests were modeled after the Peabody Picture Vocabulary Test IV (Dunn/Dunn 2007), insofar that the participants were required to match an auditory label to one of the pictures on the displayed test sheet. However, whereas the PPVT-IV is untimed, the response time in the picture vocabulary tests used in this study was limited to 0.5 seconds in order to measure the participants' efficiency of receptive lexical access. Since the average speaking rate is three to four words per second, this is plenty of time to process and respond to the out-of-context auditory label, yet any delays can be noted and possibly result in mismatching or failing to respond.

Both English and Croatian versions encompassed one practice sheet and ten test sheets for testing 30 words in each language. The participants were required to match an auditory label to one of the six pictures on the displayed test sheet (see Appendix 2). Since the objective of this research was not to test the breadth of vocabulary, but rather the efficiency of access to the existing conceptual entries in the mental lexicon, the lexical units in the tests were chosen along the following criteria: they are not commonly used on a daily basis in everyday communication, they do not belong to a specific professional jargon (eg. medicine, law, etc.), and they belong to Croatian or English standard varieties. These criteria ensured that the participants were familiar with the words in the test regardless of their profession, education or dialect. However, we deliberately avoided extremely frequents words since access to such words is so fast that the results would not show any considerable discrepancy between any of the test groups.

The bilingual participants were administered tests in both English and Croatian whereas the participants in the control groups were administered only one test, depending on their mother tongue. The results from the monolingual

speakers were compared so that possible differences in the difficulty of the two tests could be taken into consideration during result analysis and would not falsify possible findings.

3. The Analysis of Results

Croatian and English monolingual test groups showed comparable results when tested in their mother tongue, with mean result of 92.1% for the English monolingual control group and 91.4% for the Croatian monolingual control group (as shown in the first two columns in Figure 2 respectively). The monolingual control groups also scored higher in both languages than the two bilingual groups, which is consistent with previous studies (Bialystok/Craik/Luk 2008; Gollan/Montoya/Werner 2002).

The test group with simultaneous bilinguals scored lower than their monolingual peers on both tests, with the mean score of 88% for the test in Croatian and 88.1% for the English one (as shown in the third and fourth column in Figure 2 respectively). It should be noted, however, that simultaneous bilinguals achieved comparable results in both languages tested. The test group with sequential bilinguals achieved the lowest scores: 81,2% in English and 85,4% in Croatian.[5] However, some participants in the sequential bilingual test groups stated that their first language was Croatian, whereas for others it was English. The test results were then regrouped according to these criteria, yielding 89% for sequential bilinguals when tested in their L1 and 78% for sequential bilinguals when tested in their L2 (as shown in the fifth and sixth column in Figure 2 respectively). This showed that sequential bilinguals tested better in the language they considered to be their first language, as anticipated.

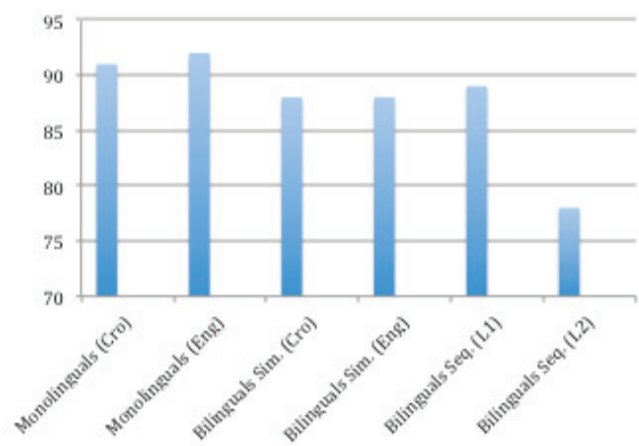


Figure 2. Test Scores (%)

[5] These results are not shown in Figure 2 since they were obtained before the participants in the sequential bilingual test group stated which language they consider to be dominant (L1), and which is their second language (L2). The change in results obtained after this criterion had been applied indicates the importance of this factor in sequential bilingualism.

The test scores from the sequential bilingual group also showed greater statistical variance than the simultaneous bilingual group or the monolingual control groups. Standard deviation in the sequential bilingual group amounted to 12.461 for the Croatian test and 13.082 for the English test, which is double the standard deviation found in control groups. To explore this variance further, the test results from the sequential test group were correlated with the participants' age, the age at which L2 was acquired, and the amount of time the second language was spoken on average.

No significant correlation was found with the participants' age. However, there appeared to be a significant negative correlation between the test results and the age at which the second language was acquired. Testing the two variables for correlation showed the Pearson Coefficient to be -0.848[6], which implies that test results are inversely proportionate to the age at which second language acquisition began. The Pearson Coefficient for second language frequency of use and test scores was 0,828, showing a significant positive correlation.

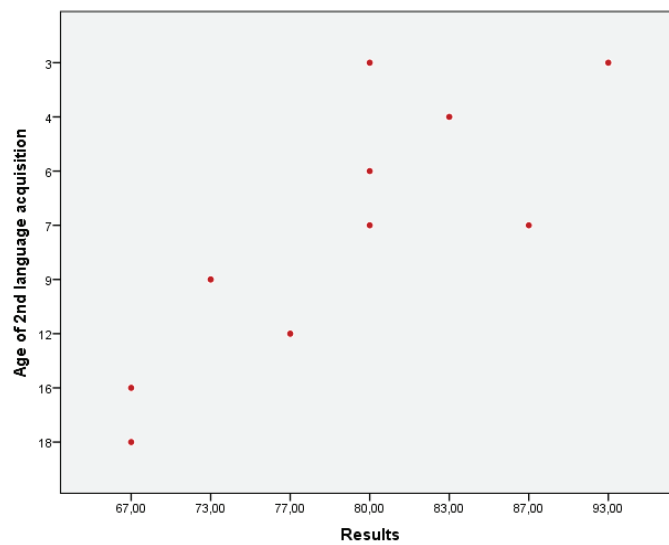


Figure 3. Correlation for age of L2 acquisition and test results

The results obtained in this study were consistent with previous works on the efficiency of lexical access, showing that bilinguals do score lower on receptive vocabulary tests than their monolingual peers. The findings also showed that there is a significant difference in receptive vocabulary performance between simultaneous and sequential bilinguals. Whereas simultaneous bilinguals showed comparable results in both languages, sequential bilinguals had lower overall results in their second language and significantly higher scores in their first

[6] The Pearson correlation is +1 in the case of a perfect positive (increasing) linear relationship, −1 in the case of a perfect decreasing (negative) linear relationship (Dowdy/ Wearden 1983).

language, even outscoring simultaneous bilinguals. This finding is consistent with claims that in sequential bilingualism the learning of a second language is facilitated by the prior learning of the first (cf. Steinberg/Nagata/Aline 2001), whereas simultaneous bilinguals have to deal with similar language problems (eg. with formal linguistic properties but also with developing psycholinguistic strategies for sentence comprehension and production) in both languages at the same time. In other words,

> 'The knowledge that words and sentences represent objects, ideas, situations, and events (...) is something that the first-language learner brings to the second-language situation and does not have to struggle to relearn.'
> (Steinberg/Nagata/Aline 2001: 234)

4. Conclusion

Only two of the aforementioned models (see footnote 1), which attempt to describe the mechanism of lexical access and word selection, can actually account for discrepancies in vocabulary performance.

The *Competition-for-Selection Model* (Starreveld/La Heij 1996; La Heij 2005; Green 1998) assumes that selection is a competitive process, not only within one language, but also across languages. This would supposedly make the *hard problem* even harder for bilingual speakers, because of a great number of equivalents in the two competing languages. For example, the English lexemes CAT and DOG are only partly conceptually related, so the non-target node receives significantly less activation than the target node, making the selection fairly simple. However, DOG and its Croatian counterpart PAS are completely synonymous and should hence receive an equal amount of activation. Such parallel activation is assumed to result in cross-language competition which additionally interferes with selection, resulting in longer response time (Linck 2008). However, such an interpretation fails to take into account the fact that in everyday situations bilinguals will not be required to perform such parallel activation – there are numerous extralinguistic factors (social, affective, cultural, etc.) that influence the choice of one or the other language in a particular situation, which necessarily results in weaker activation of the language not currently in use. This would mean that the *hard problem* is a problem only in testing language skills, not in actual language use.

The *Competition-for-Selection Model* also provides explanation of a better performance of monolinguals over bilinguals, because interference from the non-target language could cause slower selection of lexical node in the target language for bilinguals. However, this model does not account for different performance of the two groups of bilinguals. Since the mental lexicon of both sequential and simultaneous bilinguals contains roughly the same number of equivalent terms in the two languages, this model provides no explanation why one group would outscore the other. Moreover, testing receptive vocabulary using a picture vocabulary test should not in fact invoke conflict between the two

languages. In that type of test, language is predetermined, a word is displayed in one language or the other, and the participants simply choose the picture that depicts it, so there is no need to select between two equivalent terms.

The *Frequency Model* (Gollan/Acenas 2004; Gollan/Montoya/Werner 2002), on the other hand, suggests that bilingualism reduces the frequency of use of any item in the lexicon of a bilingual speaker. Authors of this model propose that since a bilingual speaker has roughly twice as many lexical items than a monolingual speaker, any item from one language is by default used less often. To illustrate, if monolingual speakers only have the lexical entry DOG available in their mental lexicon, they will use this entry every time to describe a dog. Bilinguals, however, have both DOG and PAS at their disposal and use them interchangeably, depending on the linguistic or situational context, which means that each of these two items will be used less frequently. This reduction in use results in the reduction of functional frequency and is regarded as the reason for slower lexical access.

This explanation is plausible and consistent with the findings in this study, and would most certainly make a good starting point for more extensive studies in this direction. Since the sequential bilinguals started learning their second language at a later age, they had more experience retrieving words from their L1 than their L2. Correlating test scores of sequential bilinguals with the age of L2 acquisition confirmed this, showing a strong negative correlation. It is also possible that this effect is due to the natural ability of children to absorb language during the critical period (cf. Johnson/Newport 1989), but correlation was also noted in participants who started learning their second language at a later age. Moreover, test results also roughly correlated with the amount of time the bilinguals used a certain language. Functional frequency therefore seems to be of great importance in receptive vocabulary performance and lexical access.

Nevertheless, this study in no way implies that functional frequency is the only factor influencing receptive vocabulary performance and there are many variables that may be involved in testing receptive vocabulary and lexical access. The sequential bilinguals showed greatest variance in their test results, which correlated strongly with the age of second language learning and frequency of use, speaking in favor of the *Frequency Model* of lexical access and selection. It should also be noted that the present study explored lexical access only through receptive vocabulary, and on a smaller scale. Therefore, the findings do not have any universal implications for mechanisms of lexical access or selection in the process of lexical production. The study does, however, show that there is a significant difference between simultaneous and sequential bilinguals, which should be taken into consideration when researching lexical access.

Appendix 1: Score Sheets

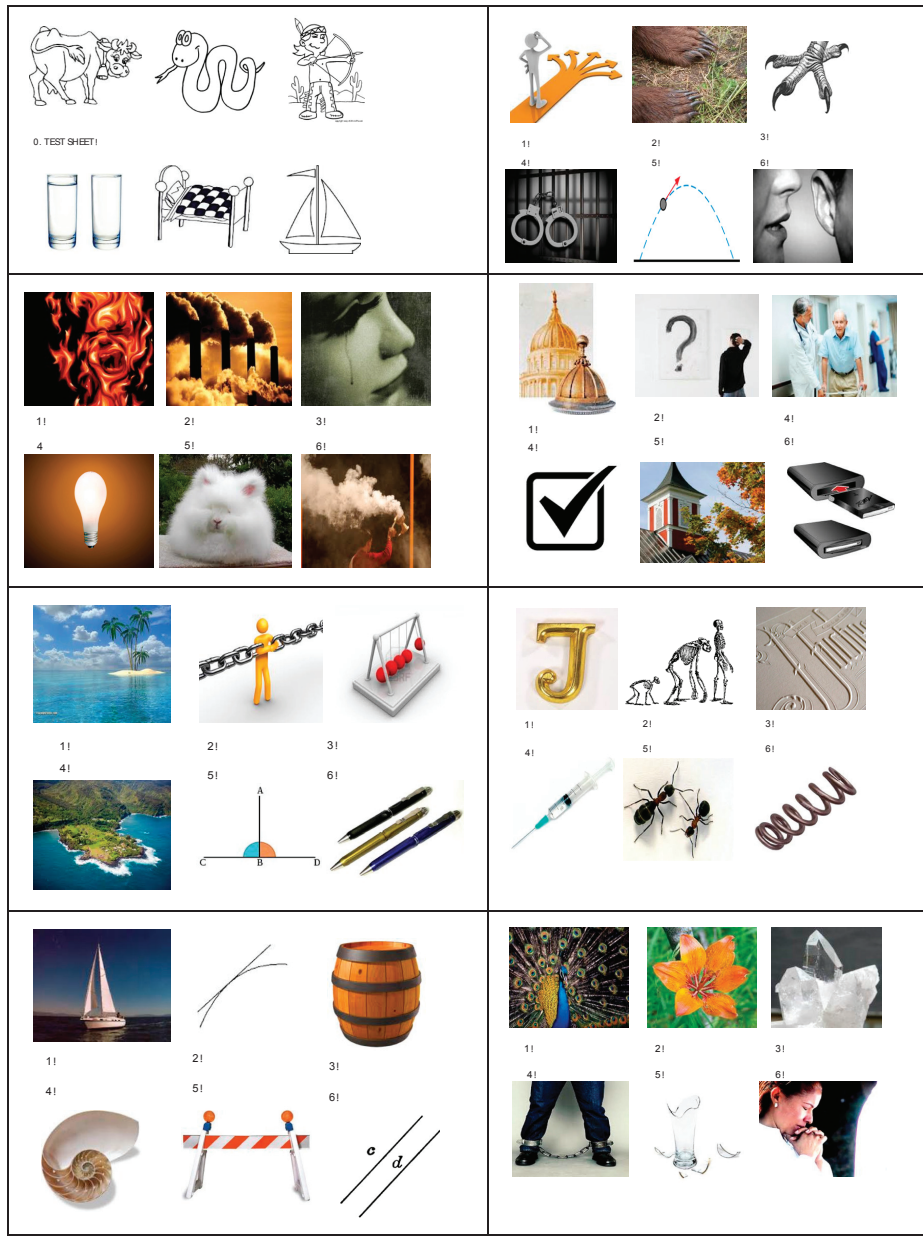
No	WORD	R	W
0	Pas		
0	Hladno		
0	Plakati		
1	Reprodukcija		
2	Sablast		
3	Okamina		
4	Fragment		
5	Horizontalno		
6	Timariti		
7	Čvorište		
8	Razdor		
9	Igličav		
10	Ognjište		
1	Meandar		
12	Raščlamba		
13	Kresati		
14	Naklonost		
15	Stratigrafija		
16	Uprizorenje		
17	Tok		
18	Ličiti		
19	Opasan		
20	Potpiriti		
21	Razglasiti		
22	Omeđen		
23	Praskozorje		
2	Tmurno		
25	Upravljač		
26	Elokventan		
27	Caklina		
28	Embrij		
29	Ozaren		
30	Kronologija		
	Score:		

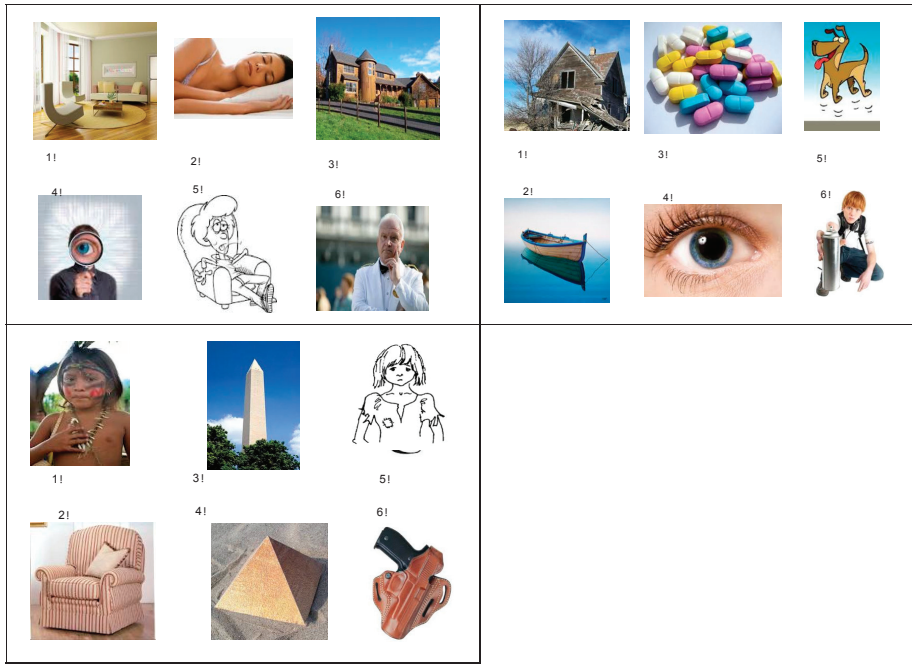
Test no.
Age:
Gender:
ML/BL-P/BL-S
L1:
L2 ac. age:
Self-rated proficiency, L1
Self-rated proficiency, L2
Frequency of use (L2): <10%, 10-30%, 30-50%, 50-70%, 70-90%, >90

No	WORD	R	W
0	Boat		
0	Snake		
0	Empty		
1	Trajectory		
2	Talon		
3	Confiding		
4	Incandescent		
5	Fury		
6	Exhaust		
7	Cupola		
	Infirm		
9	Incertitude		
10	Constrain		
11	Perpendicular		
12	Peninsula		
13	Syringe		
14	Embossed		
15	Anthropoid		
16	Nautical		
17	Tangent		
18	Barricade		
19	Fettered		
20	Fragile		
21	Vitreous		
22	Fatigued		
23	Exterior		
24	Contemplating		
25	Tranquil		
26	Jubilant		
27	Dilapidated		
28	Upholstery		
29	Indigent		
30	Obelisk		
	Score:		

Test no.
Age:
Gender:
ML/BL-P/BL-S
L1 :
L2 ac. age:
Self-rated proficiency, L1
Self-rated proficiency, L2
Frequency of use (L2): <10%, 10-30%, 30-50%, 50-70%, 70-90%, >90

Appendix 2: Picture vocabulary test for English




1!
2!
3!
4!
5!
6!
1!
3!
5!
2!
4!
6!
1!
3!
5!
2!
4!
6!

References

Baker, Colin. 2011. *Foundations of Bilingual Education and Bilingualism*. Ontario: UTP

Ben-Zeev, Sandra. 1977. The influence of bilingualism on cognitive strategy and cognitive development, in: *Child Development*, 48, pp. 1009–1018.

Bialystok, Ellen / Craik, Fergus / Luk, Gigi. 2008. Lexical access in bilinguals: Effects of vocabulary size and executive control, in: *Journal of Neurolinguistics*, 21(6), pp. 522–538.

Bialystok, Ellen / Craik, Fergus / Klein, Raymond / Viswanathan, Mythili. 2004. Bilingualism, aging, and cognitive control: Evidence from the Simon Task, in: *Psychology and Aging*, 19, pp. 290–303.

Bloomfield, Leonard. 1935. Linguistic aspects of science, in: *Philosophy of Science,* 2, pp. 499-517

Blumenfeld, Hal / Marian, Viorica. 2007. Constraints on parallel activation in bilingual spoken language processing: Examining proficiency and lexical status using eye-tracking, in: *Language and Cognitive Processes*, 22, pp. 633–660.

Caramazza, Alfonso. 1997. How many levels of processing are there in lexical access?, in: *Cognitive Neuropsychology*, 14, pp.177-208.

Costa, Albert / Caramazza, Alfonso. 1999. Is lexical selection in bilingual speech production language-specific? Further evidence from Spanish-English and English-Spanish bilinguals, in: *Bilingualism: Language & Cognition*, 2, pp. 231-244

Costa, Albert / Colomé, Àngels / Caramazza, Alfonso. 2000. Lexical Access in Speech Production: The Bilingual Case, in: *Psicológica,* 21, pp. 403-437

Costa, Albert / Santesteban, Mikel. 2004. Lexical access in bilingual speech production: evidence from language switching in highly proficient bilinguals and L2 learners, in: *Journal of Memory and Language*, 50 (4), pp. 491-511

Costa, Albert / La Heij, Wido / Navarrete, Eduardo. 2006. The dynamics of bilingual lexical access, in: *Bilingualism: Language and Cognition,* 9 (2), pp. 137–151

Collins, Allan / Loftus, Elizabeth. 1975. A spreading-activation theory of semantic processing, in: *Psychological Review*, 82 (6), pp. 407–428.

Dell, Gary. 1986. A spreading-activation theory of retrieval in sentence production, in: *Psychological Review*, 93 (3), pp. 283– 321.

De Houwer, Annick. 2005. Early bilingual acquisition: Focus on morphosyntax and the separate development hypothesis, in: Kroll/De Groot. 2005.

De Houwer, Annick. 2009. *An Introduction to Bilingual Development* . Clevedon, UK: Multilingual Matters.

Dowdy, Shirley / Wearden, Stanley. 1983. *Statistics for Research*. New York: John Wiley.

Dunn, Lloyd / Dunn, Douglas. 2007. *Peabody Picture Vocabulary Test*, Fourth Edition, Cambridge: Pearson

Finkbeiner, Matthew / Gollan, Tamar / Caramazza, Alfonso. 2006. Lexical access in bilingual speakers: What's the (hard) problem?, in: *Bilingualism: Language and Cognition*, 9 (2), pp. 153–166

Finkbeiner, Matthew / Almeida, Jorge / Janssen, Niels / Caramazza, Alfonso. 2006. Lexical selection in bilingual speech production does not involve language

suppression, in: *Journal of Experimental Psychology: Learning, Memory and Cognition*, 32 (5), pp. 1075-1089.

Ferguson, Charles. 1964. Diglossia, in: *Language in Culture and Society*. [ur. Dell Hymes], New York: Harper and Row, pp. 429-439.

Gollan, Tamar / Montoya, Rosa / Werner, Grace. 2002. Semantic and letter fluency in Spanish–English bilinguals, in: *Neuropsychology*, 16, pp. 562–576.

Gollan, Tamar / Acenas, Lori-Ann. 2004. What is a TOT?: Cognate and translation effects on tip-of-the-tongue states in Spanish-English and Tagalog-English bilinguals, in: *Journal of Experimental Psychology: Learning, Memory and Cognition*, 30, pp. 246-269.

Gottardo, Alexandra / Grant, Amy. 2008. Assessment of reading acquisition in bilinguals, at: www.literacyencyclopedia.ca

Green, David. 1986. Control, activation and resource, in: *Brain and Language*, 27, pp. 210–223.

Green, David. 1993. Towards a model of L2 comprehension and production, in: *The bilingual lexicon,* [ur. Robert Schreuder / Bert Weltens], Amsterdam/ Philadelphia: John Benjamins, pp. 249–277.

Green, David. 1998. Mental control of the bilingual lexico-semantic system, in: *Bilingualism: Language and Cognition*, 1, pp. 67–81.

Johnson, Joseph / Newport, Elissa. 1989. Crtitical Period Effects in Second Language Learning: The influence of Maturational State on the Acquisition of English as a Second Language. *Cognitive Psychology* 21, pp. 60-99

Kaushanskaya, Margarita / Blumenfeld, Hal / Marian, Viorica. 2011. The relationship between vocabulary and short-term memory measures in monolingual and bilingual speakers, in: *International Journal of Bilingualism,* 15 (4), pp. 408–425

Kaushanskaya, Margarita / Marian, Viorica. 2009. The bilingual advantage in novel word learning, in: *Psychonomic Bulletin & Review*, 16, pp. 705–710

Kohnert, Kathryn / Hernandez, Arturo / Bates, Elizabeth. 1998. Bilingual performance on the Boston Naming Test: Preliminary norms in Spanish and English, in: *Brain and Language,* 65, pp. 422–440

Kroll, Judith / De Groot, Annette [ur.]. 2005. *Handbook of bilingualism: Psycholinguistic approaches*. Oxford: Oxford University Press.

Kroll, Judith / Stewart, Erika. 1994. Category interference in translation and picture naming: Evidence for asymmetric connections between bilingual memory representations, in: *Journal of Memory and Language*, 33, pp. 149-174

La Heij, Wido. 2005. Selection processes in monolingual and bilingual lexical access, in: [ur. Judith Kroll / Annette de Groot]. 2005, pp. 289–307

Levelt, William. 1989. *Speaking: From intention to articulation*. Cambridge, MA: MIT Press.

Levelt, William / Roelofs, Ardi / Meyer, Antje. 1999. A theory of lexical access in speech production, in: *Behavioral and Brain Sciences*, 22, pp. 1–75.

Linck, Jared. 2008. *The Role of Inhibition in the Control of Bilingual Speech Production.* Ann Arbor: UMI

Luce, Paul / Pisoni, David / Goldinger, Stephen. 1990. Similarity neighborhoods of spoken words, in: *Cognitive models of speech processing: Psycholinguistic and computational perspectives*, [ur. Gerry Altmann], Cambridge, MA: MIT Press.

Marslen-Wilson, William. 1987. Functional parallelism in spoken word recognition, in: *Cognition,* 25, pp. 71-102

McClelland, James / Elman, Jeff. 1986.The TRACE model of speech perception, in: *Cognitive Psychology,* 18, pp. 1-86

Marian, Viorica / Blumenfeld, Hal / Kaushanskaya, Margarita. 2007. The Language Experience and Proficiency Questionnaire (LEAP-Q): Assessing language profiles in bilinguals and multilinguals, in: *Journal of Speech, Language, and Hearing Research*, 50, pp. 940–967

Paez, Mariela / Rinaldi, Claudia. 2006. Predicting English work reading skills for Spanish speakers in first grade, in: *Topics in Language Disorders*, 62, pp. 338–350

Pearson, Barbara / Fernandez, Sylvia / Oller, D. Kimbrough. 1993. Lexical development in bilingual infants and toddlers, in: *Language Learning*, 43, pp. 93–120

Peterson, Robert / Savoy, Pamela. 1998. Lexical selection and phonological encoding during language production: Evidence for cascaded processing, in: *Journal of Experimental Psychology: Learning, Memory, and Cognition,* 2, pp. 539– 557

Roberts, Patricia / Garcia, Linda / Desrochers, Alain / Hernandez, Denise. 2002. English performance of proficient bilingual adults on the Boston Naming Test, in: *Aphasiology*, 16, 635–645.

Roelofs, Ardi. 1992. A spreading-activation theory of lemma retrieval in speaking, in: *Cognition,* 42, pp. 107–42

Starreveld, Peter / La Heij, Wido. 1996. Time-course analysis of semantic and orthographic context effects in picture naming, in: *Journal of Experimental Psychology: Learning, Memory, and Cognition,* 22, pp. 896–918

Steinberg, Danny / Nagata, Hiroshi / Aline, David. 2001. *Psycholinguistics: Language, Mind and World*, Harlow: Longman [first edition 1982]

Tokowicz, Natasha / Kroll, Judith / De Groot, Annette / Van Hell, Janet. 2002. Number-of-translation norms for Dutch-English translation pairs: A new tool for examining language production, in: *Behavior Research Methods, Instruments & Computers,* 34, pp. 435–451

Valdes, Guadalupe / Figueroa, Richard. 1994. *Bilingualism and Testing: A Special Case of Bias*. Norwood, NJ: Ablex.

Windsor, Jennifer / Kohnert, Kathryn. 2004. The search for common ground – Part I: Lexical performance of linguistically diverse learners, in: *Journal of Speech, Language, and Hearing Research*, 47, pp. 877–890

Wurm, Lee et al. 2003. Semantic effects in lexical access: Evidence from single-word naming, in: *Cognition and Emotion*, 17 (4), pp. 547-565

RAZLIKE U UČINKOVITOSTI PRISTUPA LEKSIKU KOD DVOJEZIČNIH GOVORNIKA HRVATSKOG I ENGLESKOG JEZIKA

Dosadašnje su studije pokazale da dvojezične odrasle osobe, kao i dvojezična djeca, postižu slabije rezultate od svojih jednojezičnih vršnjaka na standardiziranim testovima, kojima se ispituje produktivni i receptivni rječnik. S obzirom na to da ne postoji bitna razlika u opsegu konceptualnog leksika kod dvojezičnih i jednojezičnih osoba, pretpostavlja se da je uzrok slabijih rezultata teži pristup leksiku kod dvojezičnih govornika. Postoji nekoliko modela (v. bilješku 1) koji nastoje objasniti te diskrepancije, a u čijem su središtu istraživanja širenje aktivacije i mehanizmi odabira kod pristupa leksiku. Ipak, zasad ne postoji dovoljno čvrstih dokaza koji bi poduprli bilo koji od postojećih modela, kao ni studija koje bi ispitivale razliku u postignuću između simultanih i sekvencijalnih dvojezičnih govornika. Stoga je provedeno testiranje učinkovitosti pristupa leksiku kod simultanih i sekvencijalih dvojezičnih govornika hrvatskog i engleskog jezika uz pomoć slikovnog testa rječnika. U testiranju su sudjelovale dvije grupe dvojezičnih govornika, deset simultanih i deset sekvencijalnih, te dvije kontrolne grupe s po deset izvornih jednojezičnih govornika hrvatskog i engleskog jezika. Svakoj dvojezičnoj grupi dan je test i na hrvatskom i na engleskom jeziku. Cilj ispitivanja bilo je utvrditi postoji li bitna razlika u postignuću između dviju grupa dvojezičnih govornika te između dvojezičnih govornika i njihovih jednojezičnih vršnjaka, a rezultati su pokazali da su jednojezične kontrolne skupine imale podjednak rezultat (91,4% za hrvatski i 92,1% za engleski) te su imale bolji rezultat u usporedbi s dvije dvojezične grupe. Najlošiji rezultat postigli su sekvencijalni dvojezični govornici na testu koji se odnosi na nedominantan jezik, odnosno onaj koji su usvojili kao drugi (L2). Rezultati koje su postigli na testu jezika koji smatraju prvim (L1) na razini su rezultata simultanih dvojezičnih govornika. Rezultati ispitivanja također pokazuju da kod sekvencijalnih dvojezičnih govornika postoji bitna negativna korelacija između postignuća na testu i dobi u kojoj su počeli usvajati drugi jezik. Može se zaključiti da dvojezični govornici doista postižu nešto slabije rezultate na testovima receptivnog rječnika, odnosno pri mjerenju pristupa leksiku, u odnosu na jednojezične govornike, no u isto vrijeme sekvencijalni dvojezični govornici pokazuju bolje rezultate na prvom jeziku čak i od simultanih dvojezičnih govornika. Imajući to u vidu, smatramo frekvencijski model (Gollan/ Acenas 2004; Gollan/Montoya/Werner 2002) najprikladnijim modelom zato što takve razlike u postignuću pripisuje smanjenoj frekvenciji uporabe svih riječi u leksiku dvojezičnih govornika, a smanjena frekvencija uporabe uzrokuje smanjenu funkcionalnu frekvenciju, odnosno sporiji pristup leksiku. Kada je riječ o sekvencijalnim dvojezičnim govornicima, čini se da osim funkcionalne frekvencije utjecaj na postignuća pri mjerenju pristupa leksiku imaju i dob u kojoj je počelo usvajanje drugog jezika, kao i vrijeme korištenja pojedinog jezika, što znači da pri istraživanju pristupa leksiku kod dvojezičnih govornika svakako treba uzeti u obzir i razliku između simultanih i sekvencijalnih dvojezičnih govornika.

Key words: bilinguals, lexical access, receptive vocabulary, Croatian, English
Ključne riječi: dvojezični govornici, pristup leksiku, receptivni rječnik, hrvatski, engleski