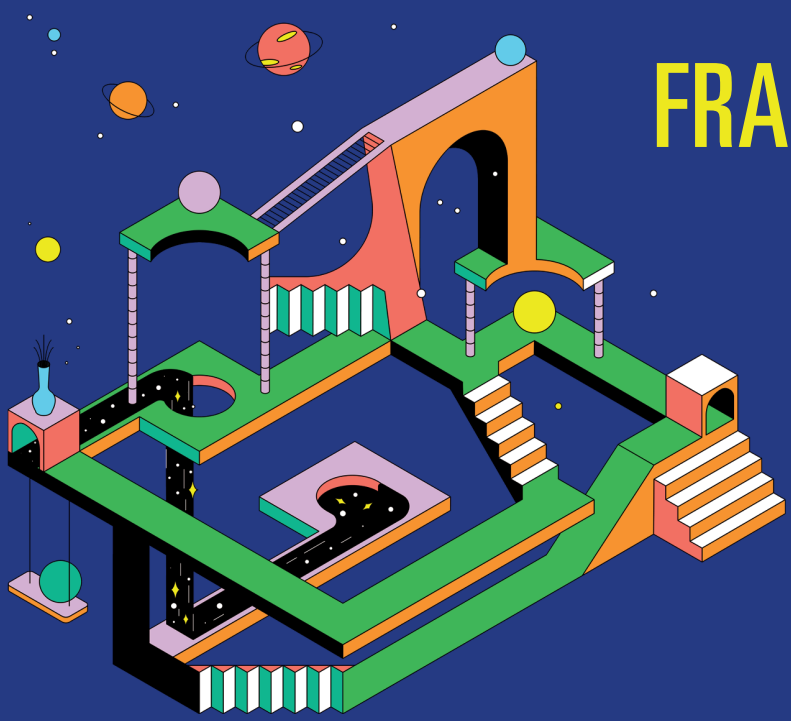
Grojean, F. (2022). Is Language Processing in Bilinguals Selective or Non-Selective? In F. Grosjean, *The Mysteries of Bilingualism. Unresolved Issues.* Chichester UK: John Wiley & Sons

https://www.wiley.com/en-us/The+Mysteries+of+Bilingualism%3A+Unresolved+Issues-p-9781119602378

The MYSTERIES of BILINGUALISM



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Is Language Processing in Bilinguals Selective or Non-selective?

One of the questions researchers have asked themselves concerning the perception and production of language by bilinguals is whether processing is selective or non-selective when only one language is being used. In other words, When they perceive and comprehend just one language, is only that language involved in the processing, or do(es) the other(s) intervene?; and, When they are speaking a single language, without code-switching or borrowing, do they call on just that language or do(es) the other(s) play a role?

Until recently, many researchers have opted for non-selectivity. Thus, for example, Costa (2005) wrote concerning production that there is wide agreement in assuming that the conceptual system activates the two languages of a bilingual simultaneously and that this supports the notion that the activation flow from the conceptual system to the lexical system is language non-selective. A few years later, Bialystok et al. (2009) stated that it is now well documented that both languages of a bilingual are jointly activated even in contexts that strongly bias towards one of them. Green and Abutalebi (2013) went along with this when they said that substantial experimental evidence indicates that in bilingual speakers, both languages are active even when only one is being used. Finally, and quite recently, Marian (2019), writing about word recognition, stated that not only do the words we hear activate other, similar-sounding words, but the translations of those words in other languages become activated. And that same year, Paap (2019) stated that there is considerable evidence that during reading, listening, and speaking, words in the non-target language become coactivated and create conflict that needs resolution.

Thus, to the question of whether processing in bilinguals is selective or non-selective when just one language is being used, many researchers have opted for non-selectivity. But this opinion is starting to change as more research is conducted.

In this chapter, we will study selectivity in language perception and comprehension first of all, be it written or oral, and then in spoken language production. We will describe studies that have found non-selectivity, but also studies that have shown selectivity, and we will try to understand why it is that they come to different conclusions. We will also show that many different factors are involved such as language proficiency, language dominance, the context and the people present, the type of stimuli being produced or perceived, as well as the experimental task bilinguals are asked to do. We will end with a brief summary of two accounts of what happens when a bilingual is speaking just one language – that of the language mode framework, and that of the adaptive control hypothesis.

The Mysteries of Bilingualism, First Edition. François Grosjean.

Language Perception and Comprehension

In this first part, we will examine a few studies that show non-selectivity as well as some that show the reverse. We will then consider some factors that seem to play a role in whether just one language is involved or all languages play a role.

Examples of Studies that Show Non-selectivity

Paulmann et al. (2006) asked their German–English bilingual participants to do a visual lexical decision task whilst they measured event-related brain potentials (ERPs). They presented interlingual homographs, that is words written in the same way in two languages but that have different meanings, and often a different pronunciation. They wanted to know whether a visual homograph presented in English as a prime, such as "chef," would activate the German meaning of "chef," which is "boss." The English word "boss" was presented as the target following the word "chef" and the participants had to say whether it was a word or not. Another example was "bald" as a prime and "soon" as a target ("bald" means "soon" in German). The interlingual homograph always served as the prime and the target always reflected the German meaning of the interlingual homograph.

The researchers also changed the global language context by showing a film either in German or in English before the experiment which always took place in English. They argued that if the expectation caused by the English film was not sufficient to close out German, and the participants showed the presence of activation in their German, then a non-selective view could be supported.

Their participants were German speakers who had started learning English between the ages of ten and 11, who had spent a mean of 17 months in an English-speaking country, and who were proficient in English. The experiment was conducted in English and the instructions, also in English, asked the participants to read the two words on the screen, presented one after the other, and to decide whether the second word was a word or not, that is, make a lexical decision. After some practice, and before the actual experiment started, the English or German version of the short film was presented to the participants.

In the results obtained, the reaction times showed no language context effect. That is, whether the film had been in English or German, the participants responded in the same amount of time to the target following a homograph. The language version of the film did not seem to play a role, therefore. As for the ERP measurements, the priming effects were the same regardless of the language of the film. The researchers concluded that there was an automatic, parallel activation of both the first and second language lexical entries during the presentation of interlingual homographs. They argued that the bilinguals were not able to consciously or unconsciously suppress the influence of the first language in a second-language task preceded by a global second language setting.

As we will see often in this chapter, various external factors were present and may explain, in part at least, the results obtained. Among top-down factors, the experiment took place in a German laboratory and German was the language used daily by all concerned. I contacted the senior author in 2020 and she told me that they had greeted their participants in German, and that the debriefing had also taken place in that language. Could German really have been fully deactivated during the experiment, at least in those who saw the English version of the movie? One can have doubts especially if some (or all) had known from others that this was a study related to their bilingualism,

and hence both their languages might come in useful. Another factor, more bottom-up this time, is that the participants saw language ambiguous words during the experiment such as "chef" and "bald," among many other interlingual homographs. This, along with seeing the meaning of these words presented as targets ("boss" and "soon," respectively) might well have kept their two languages active. I have called this being in a "bilingual language mode" (Grosjean 2001). As Wu and Thierry (2010) have written, "… stimuli with a special status in the two languages of a bilingual speaker, such as cognates, and interlingual homographs, create a dual-language processing context which … raises the participants' explicit or implicit awareness of the bilingual context of testing."

Another study which also proposed that language processing is non-selective was conducted by Spivey and Marian (1999) with Russian-English bilinguals. They used a head-mounted eye tracker which allows the experimenter to see where the participants are looking while speech comprehension is taking place. Their bilingual participants were asked to look at a 3 by 3 board that contained a number of objects. For example, a stamp was in the bottom right-hand square, a marker (or a ruler) in the top left-hand square, and two filler objects in the top-right and bottom-left squares.

In the Russian part of the study, the participants were given instructions in Russian to displace the target object on the board to the middle square. For example, "Poloji marku nije krestika" (Put the stamp below the cross). In the interlingual competitor condition, an object on the board had an English name that shared initial phonetic characteristics with the onset of the name of the Russian target object. Thus when the target object was a stamp ("marku"), the interlingual competitor object was a marker, an object whose English name shares the same word beginning as "marku." The researchers examined the eye movements made to this interlingual competitor object as compared to a control object, in exactly the same position, such as a ruler. In this condition, the object's name bore no phonetic similarity with the name of the target object ("marku").

The results obtained showed that the participants made significantly more eye movements to the interlingual competitor object (32%) than to the control object (7%). Why was that? It would seem that the word onset of the target object (e.g., "marku") not only activated Russian words in the Russian lexicon but also English words in the English lexicon that began in a similar way ("marker" is very similar to "marku"). This happened through bottom-up processing, that is, the processing of the speech input. Based on this, the authors concluded that processing is non-selective.

This study, among many others, reinforced the non-selectivity position of researchers such as those quoted in the introduction. But during the same time, and especially in the last years, those who believed in selectivity were working on the topic. In addition, some of those who believed in non-selectivity were redoing their experiments and controlling certain factors. As we will see below, the results they obtained were quite different.

Examples of Studies that Show Selectivity

A few years after their first study, Marian and Spivey (2003) came back to the question. They thought that several things may have activated the other language such as the fact that the bilinguals knew they were taking part in an experiment on bilingualism (as might have been the case in the Paulmann et al. 2006 study), that they were tested by bilingual experimenters fluent in both languages, and that the two languages were tested in adjacent experimental sessions. We could add that the bilingual participants probably knew that the laboratory was doing bilingual research (in part, at least), and

that they may have received reports from other participants who had taken part in the experiment. In short, there were enough factors present to produce the results obtained.

So as to put their participants in a situation that deactivated the other language as best as possible, the authors undertook a new study in which they used different experimenters who posed as monolingual speakers for the Russian and then the English sessions. (Note that we will concentrate here on the Russian session once again.) And during testing, they used only the language of the session, and participants only took part in one or the other session. The results they obtained were quite convincing. The participants looked at interlingual English competitor objects in only 8% of the trials as opposed to 5% for the control object, a non-significant difference. It should be recalled that in their first study, the percentages had been 32% and 7%, respectively. Now that the other language had been totally "closed out," processing had become selective.

Other researchers who showed selective processing were Dunn and Fox Tree (2014). Like Paulmann et al. (2006) they used a lexical decision task in English but did not measure ERP. They made sure that their Spanish–English bilingual participants were unaware that their bilingualism was of interest to them. Along with a group of monolingual English speakers, they were greeted by non-Latino research assistants in English. All sessions were also scheduled so as to avoid that they encounter any known bilingual or Latino participants or students. And the English written words that were presented in the experiment contained no homographs or cognates. The results were clear. The reaction times were similar for bilinguals and monolinguals, both for words and for non-words. Clearly, processing was selective and the bilingual's knowledge of Spanish did not intervene in anyway in their processing of English.

What is interesting is that the experimenters then showed a Pink Panther video to their participants and asked them to retell the story. For half the bilinguals, however, and prior to viewing the video, a Latina experimenter entered the room and revealed her ability to speak and understand Spanish. She asked those participants to retell the story in Spanish, providing the cover story that Spanish retellings would enrich their database. All participants then did a second lexical decision task. The results were now different for the bilingual subgroup that had retold the story in Spanish. They took longer to reject English non-words in the study. The researchers explain this by the fact that they had both their languages competing during the processing of non-words, that is, they were in a "bilingual mode," to use the language mode terminology (see Chapter 7). This raises the possibility that bilingual listeners will be sensitive to factors that will result in processing being selective at times and non-selective at other times, as we will see below.

Factors that Affect Whether Perception Is Selective or Not

An important factor that plays a role in selectivity is language proficiency. If a study is done in the dominant or first language, and the other language is less well-known, then a more selective process will emerge. And the reverse occurs when the weaker language is used. In the first of two studies undertaken by Weber and Cutler (2004; Studies 3 and 4), Dutch–English bilinguals were presented with spoken words in their second language, English. The visual display from which they had to select a target included a distractor item of which the Dutch name, but not the English name, made it a potential competitor. Thus, for example, they heard, "Click on the kitten. Now put it on top of the diamond," whilst they also saw a visual competitor whose name in Dutch ("kist," which means "chest") overlapped phonemically with the beginning of the target ("kitten"). The proportion of fixations obtained showed that the Dutch competitors were activated

when the bilingual participants did the study but not when a control group of monolingual American speakers responded. They concluded, like Spivey and Marian (1999), that non-native listeners experienced spurious competition from native language candidates, that is, that processing was non-selective.

However, Weber and Cutler then asked themselves what would happen when bilinguals listened to their first language. They therefore changed the language of the experiment, and of the test items, and ran a second group on the new stimuli. The result was clear: they found no activation of the English competitors! Their conclusion was that for listeners who use their second language less frequently than their native language, competition when listening to the native language is not increased by second language candidates.

Another factor that affects the activation of the other language is the bottom-up information heard by participants. Ju and Luce (2004) tested highly proficient Spanish–English bilinguals in Spanish using an eye-tracking task like Spivey and Marian (1999). They manipulated primarily the Voice Onset Time (VOT) of the first consonant of the Spanish target words, that is, the brief delay between the release burst and glottal pulsing, and replaced it with its English counterpart. For example, the Spanish /p/ of the word "playa" (beach) was basically replaced with the English /p/ sound (the two differ in VOT but also in aspiration). This was enough to attract eye movements to the interlingual competitor object (a picture of "pliers") when the participants were asked to click on the picture that corresponded to the target word ("playa" said with the English /p/ sound). Thus, even a subtle phonetic cue from the other language is enough to activate it.

Lexical information can also play a role. Lagrou, Hartsuiker, and Duyck (2011) presented interlingual homophones with almost complete overlap between Dutch and English (e.g., Dutch "lief" (sweet), English "leaf" /li:f/). They asked dominant Dutch–English bilinguals to decide whether these words pronounced in English were words or non-words. Only 10% of the stimuli were interlingual homophones and yet despite being buried among other words, the homophones were recognized more slowly than control words and produced more errors.

In a later study, Lagrou, Hartsuiker, and Duyck (2013) preceded these words with low constraining sentences (e.g., "When you walk in the forest, there is a chance that you find a leaf") and high constraining sentences (e.g., "When the fall is coming in September most trees are losing more than one leaf"). They still found a homophone effect, but it was far weaker in the high-constraining sentences. Thus, when the semantic context points to words in the language being used in the study, cross-lingual interactions are reduced.

This was also clearly shown by Chambers and Cooke (2009) who again used an eye-tracking technique and who asked English-French bilinguals to listen to French sentences. They preceded the target words (e.g., "poule" (chicken)) with non-restrictive and restrictive sentences. In the former case, such as in "Marie va décrire la poule" (Marie will describe the chicken), there was very little prior semantic constraint on the target word (here "poule") but in the restrictive case (e.g., "Marie va nourrir la poule" (Marie will feed the chicken)), the predicate constrained the noun. The competitor object was the picture of an interlingual homophone (a picture of a "pool" in our example).

The researchers found that consideration of the interlingual competitor object was greatly reduced when the context sentence was restrictive. But why was the number not reduced to zero? Quite simply because homophones were used in the study and participants were activating both the French lexicon and the English lexicon in a bottom-up manner. Can cross-language competition be removed totally during sentence comprehension? A study by Shook et al. (2015) would seem to show that it can. They observed no eye movements to cross-linguistic competitors in their eye-tracking study when

targets were at the end of sentences. These sentences had activated the language being used and deactivated the other language.

To study whether processing is selective or non-selective, researchers have used experimental tasks and stimuli, and put participants in particular contexts, which can at times push the results one way or the other, as discussed by Grosjean (1998, 2001). Among the top-down factors which can lead a participant to activate the language not being overtly used, we have the knowledge that the study relates to bilingualism, a laboratory that works on bilingual research, a bilingual university environment, reports from other bilingual participants who have just been in the study or who will do it soon an experimenter who is bilingual, the task that is used and/or the instructions that are bilingual, the languages used in the experimental sessions, and so on. As for bottom-up factors, there is the presence of cross-language homophones or cognates, as well as shared word onsets in phonetically similar languages, among others. In sum, just one factor, or a combination of factors, may well activate the language not being used and trigger non-selective processing.

Researchers such as Wu and Thierry (2010) have repeated Grosjean's words of warning and have even given researchers questions they should consider before doing their studies, such as: Do the experimental tasks require explicit retrieval of representations from one or the two languages? Do the experiments involve stimuli from those languages or stimuli that are ambiguous? Is there any (…) contextual information that might draw the participants' attention to one language in particular? etc. Yu and Schwieter (2018) have reiterated similar warnings and they too list a number of variables that can make processing selective or non-selective.

To end this part, what can we say about the selectivity of processing in bilinguals in monolingual speech perception and comprehension? The bottom-up, phonetic, information that is heard is processed by the language(s) that contain(s) elements of that input and this can lead to non-selective processing, such as when the words that are used have similar word beginnings in the other language, or when homophones, homographs, and cognates are involved, as studies have shown repeatedly. Of course, if the input only contains elements of one language, then only one language will process it. Top-down factors such as the interlocutor and the context will also play a role as we have seen. Things are further complicated by the proficiency bilinguals have in their different languages. If, for example, the weaker language is being processed, then the stronger language may be active and may influence the processing that is taking place. However, if the stronger language is being processed, then the weaker language will not be activated as much, or at all. This might even lead some listeners in everyday life to be surprised, sometimes even shocked, to hear the interlocutor say something in the weaker language. As bilinguals, we have all found ourselves in situations where we simply can't process, at least momentarily, something said in the "wrong" language. So, is processing selective, or not selective, during the perception and comprehension of just one language? As Grosjean (2013) wrote, the answer is quite simply that it depends – it will be selective at times and non-selective at other times.

Spoken Language Production

The topic of selectivity has also been studied in language production, that is when the bilingual is speaking just one language. The question remains the same: Is the other language involved or not when the bilingual is speaking just one language with no code-switching or borrowing?

A Study that Showed non-selectivity

Hermans et al. (1998) asked Dutch–English bilinguals to do a picture-word interference task. They had to name pictures presented on a computer screen as quickly as possible while ignoring auditorily presented words, called distractors. In Experiment 2, the bilinguals named the pictures (e.g., of a mountain) in English, their second language, and were told to ignore the accompanying Dutch words presented orally. The latter were either phonologically related to the English name (e.g., Dutch "mouw" which means "sleeve" when the name of the picture was "mountain"), semantically related to it (e.g., Dutch "dal" which means "valley"), unrelated to it (e.g., Dutch "kaars" which means "candle") or – and this is important – phonologically related to the Dutch name of the picture (e.g., Dutch "berm" which means "verge," the Dutch name of the picture being "berg"). These phono-translations were called Phono-Dutch by the authors.

The time interval between the auditory words and the presentation of the pictures (the stimulus onset asynchrony or SOA) was varied, from minus values, meaning that the words were presented before the pictures, to positive values, meaning that the words were presented after the pictures. The crucial result concerns the latency to name the picture (e.g., "mountain") in the Phono-Dutch condition, that is, when the Dutch word ("berm" in our example) was phonologically related to the Dutch name of the picture. It was compared to the latency to name the picture when the unrelated word was heard (i.e., "kaars").

The authors found that at negative and zero SOAs, the latency to name "mountain" when "berm" was presented was slowed down significantly. Their explanation was that the auditory word "berm" probably activated the Dutch word "berg" in the participants' internal lexicon and hence made it harder to select the English word "mountain." They concluded that in the initial stages of word selection, bilingual speakers do not appear to be able to prevent their first language from interfering with the production of their second language.

Even though this study has been referred to often by those who defend non-selectivity, other researchers have pointed out a number of methodological issues with this kind of research. An important one is that tasks that call on the bilingual's two languages, as is the case here, will activate both languages in the bilingual. This becomes a very real problem when the question being studied pertains to such issues as selective versus non-selective processing (Grosjean 1998). Costa, La Heij, and Navarette (2006) stated something very similar: one should assess whether there is activation of the non-response language in experimental circumstances in which such a language is not called into play at all. These words of warning started to be heeded by researchers and new studies were undertaken.

Studies that Show Selective Processing

Boukadi, Davies, and Wilson (2015) used the same task as Hermans et al. (1998), the picture-word interference task, but made sure that in the first of their two experiments, the language setting was entirely monolingual. Tunisian Arabic–French bilinguals named pictures in French while ignoring French auditory distractors. They were of the same type as in the Hermans et al. study – phonologically related, semantically related, unrelated, and phono-translations. Concerning the latter, the participants would see, for example, the picture of a candle (a "bougie" in French), which they had to name, and they heard at the same time the French word "chapeau." If non-selectivity occurred, this distractor might activate /ʃamʕa/ which is the Tunisian Arabic name for "bougie." The

two words also share the first two phonemes. Were that to happen, then this should be reflected in slower naming latencies as compared to the unrelated distractor.

When this first experiment took place, the participants only communicated with the experimenter in French. They were never informed that the research was related to bilingualism, all experimental instructions and stimuli were presented in French and, as we saw, the naming of the pictures took place in French. The results obtained were clear: the phono-translations did not affect naming latencies unlike in the Hermans et al. study. The experimenters took this absence of an interference effect as an indication that lexical selection proceeded in a language-specific way, that is that processing was selective in a monolingual context.

A second experiment was then conducted. Here the participants named the picture in French again, but all the auditory distractors were in Arabic. Thus, in the crucial phono-translation condition, the picture was that of a candle ("bougie" in French) and the spoken Tunisian Arabic distractor was /ʃabka/ which means "net." Here it was thought that the distractor might boost the activation of /ʃamʕa/ (they share the same first two phonemes) which is the Arabic name for a "bougie." The two words, "bougie" and /ʃamʕa/, would compete for lexical selection during naming, reflected in slower naming latencies as compared to the unrelated distractor.

When the experiment was run, the participants were told that the research was on bilingualism, they were allowed to speak their native language (Tunisian Arabic), the experimenter switched willingly between French and Tunisian Arabic while explaining the nature of the experiment and giving instructions, and so on. The results were as expected: all distractors interfered with the picture naming, including the phono-translations. This showed that the non-target language names of the pictures were activated and competed for selection during naming. The researchers concluded that the participants had to be in a bilingual context, or mode, for the phono-translations to interfere. In a monolingual mode, as in their first experiment, only the target language was activated. They concluded that lexical selection in bilinguals is a dynamic process modulated by factors like language similarity, language proficiency, and the experimental language context.

Hermans et al. (2011) also showed that when participants are in a monolingual context, processing is selective, but when they are in a bilingual context, then it is non-selective. (Note that this is the same senior author who had argued for non-selectivity in 1998; see above). In their first experiment, they asked Dutch–English bilinguals to look at pictures on a computer screen followed by a letter representing a phoneme. They had to decide whether the phoneme was part of the English name of the picture presented just before. There were three possibilities. First, the phoneme could be part of the English name of the picture. For example, /b/ or /t/ are phonemes of the word "bottle" corresponding to the picture of a bottle presented on the screen. The answer would be "yes" therefore (they called this the affirmative condition). Second, the phoneme could be the first consonant of the Dutch name of the picture being presented (e.g., /f/ is part of "fles," the Dutch translation equivalent of "bottle"). Here the answer would be "no" (they called this the cross-language condition). And finally, the phoneme could be part of neither the English nor the Dutch name (e.g., /p/ is not part of "bottle" or "fles").

The pictures were divided up into two categories: half the pictures were used in the experimental condition where there was an English name and a noncognate translation equivalent in Dutch. Examples are: "bottle" ("fles" in Dutch); "pillow" ("kussen" in Dutch), and so on. The other half were used in the filler condition. It is in this condition that the experiments differ from one another. In the first experiment, all the filler pictures had noncognate names in Dutch and English. (The authors defined cognates as

translation equivalents that have similar orthographic and phonological forms in both languages, e.g., English "apple" and Dutch "appel.") Examples of noncognates would be English "money" and Dutch "geld"; English "present" and Dutch "cadeau," etc. The results the authors obtained showed that there was no difference between the cross-language condition and the unrelated condition, be it in response latencies or in accuracy scores. They concluded from this that the Dutch name of the picture was not phonologically activated during phoneme monitoring in the bilinguals' second language. Processing was selective therefore, as in the Boukadi et al. study.

In the second experiment, all the authors did was to change the filler stimuli. The fillers now contained cognate names in English and Dutch, such as "moon" and Dutch "maan," "mouse" and "muis," and so on. This time the two critical conditions (cross-linguistic and unrelated) did produce different response latencies and accuracy scores. It took the participants more time to do the task in the cross-linguistic condition than in the unrelated condition, and they were also less accurate. Processing had become non-selective therefore. In their third experiment, the authors simply replicated the second experiment with 25% of the fillers that were cognate and 75% that were not cognate. They obtained results similar to those of the second experiment.

Despite many other factors that could have been changed, Hermans et al. (2011) concentrated just on the composition of the stimulus list in their study. According to them, if the list contains filler pictures that have noncognate names exclusively, then the Dutch names of the pictures are not activated when monitoring takes place in English (see the first experiment in this study). However, when the stimulus list contains filler pictures that do have cognate names in Dutch and English (this was the case in the second and third experiments), then the phonological representations of the Dutch picture names are activated and they slow down the response regarding the presence of a phoneme in the English name.

Based on these findings, we can only agree with the authors who concluded that the bilingual language production system is indeed dynamic and that it too can operate in different activation states. Grosjean (2013) listed a number of factors that could create these states when bilinguals speak. Among these we find the languages involved (including proficiency, dominance, recency of use, etc.), the general context (a bilingual or monolingual environment, the interlocutors), the context of the study (a study relating to bilingualism or not, the use of two languages in the experiment), other people (the presence of bilinguals or not), the topic, the stimuli used (the use of cognates, homophones and homographs, code-switches or borrowings), the experimental task (does it call on both languages or not), etc.

A Brief Summary of Two Theoretical Frameworks

As we have just seen, the spoken language production systems of bilinguals can be in different states, all the way from a state where just one language is being produced to a state where two of more languages are produced, separately or in an intermingled manner, as when bilinguals code-switch and borrow. Grosjean (2001) has called this being in different language modes. Another framework, that of Green and Abutalebi (2013), is the adaptive control hypothesis and it too accounts for monolingual as well as bilingual speech production. In what follows, we will concentrate just on monolingual speech production in bilinguals, and describe rapidly how the two frameworks talk about it.

Language mode: As we have already seen in Chapter 7, Grosjean (2001) defines language mode as the state of activation of the bilingual's languages and processing

mechanism at a given point in time. According to him, bilingual speakers navigate along a situational continuum ranging from a monolingual to a bilingual language mode. They differ among themselves as to the extent they travel along the continuum; some rarely find themselves at the bilingual end (for example, bilinguals who rarely code-switch, sometimes on principle) whereas others rarely leave this end (for example, bilinguals who live in communities where mixed language is the norm).

Being in a monolingual mode happens primarily when bilinguals are in situations where they cannot use their other language(s) such as interacting with monolinguals or being forbidden to use another language. In this particular mode, bilinguals deactivate their other language(s), most often subconsciously, so that it is (they are) not produced. This in turn prevents changing the base language – the language of the interaction – as well as producing code-switches or borrowings. However, and this is important, dynamic interferences may still take place, that is ephemeral intrusions in the language being spoken due to the influence of the other deactivated language(s). As Grosjean (2012) stated, research will have to explain at what point, and how, such interferences occur in the speech production process despite the fact that the speech produced is monolingual. Models such as those of De Bot (1992, 2004) have not done so adequately.

Grosjean (2001) also discusses bilinguals who are highly dominant in one language. They may simply not be able to control language mode in the same way as less dominant or balanced bilinguals. Although they may deactivate their stronger language in a monolingual environment that requires only the weaker language, the latter may simply not be developed enough or active enough to allow them to stay in a monolingual mode.

The adaptive control hypothesis: Green and Abutalebi (2013) also take into account in their framework the interactional context bilinguals find themselves in. But instead of proposing a continuum of states, as does Grosjean (2001), they propose three interactional contexts: a single-language context, a dual-language context, and a dense code-switching context. These contexts reflect everyday conversational use of language by bilinguals. Speakers may experience all three contexts to different extents, as in the language mode framework.

As stated in Chapter 7, in the single-language context one language is used in one environment and the other in a second distinct environment. Hence, frequent switching between languages does not take place. To stay in this context, and avoid cross-language intrusions, speakers maintain the current language goal using the goal maintenance process. It is not totally clear how intrusions are avoided but a control process, interference suppression, intervenes. According to the authors, speaking in one language to the exclusion of another is linked to a suppressive state, with inhibitory processes being central to the control of interference.

To conclude this chapter, whether language processing in bilinguals is selective or non-selective when only one language is being used, be it in perception and comprehension, or in production, depends on different aspects. There is definitely no unique answer since the final outcome is governed by many internal as well as external factors.

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