Multidisciplinary Approaches to Code Switching

STUDIES IN BILINGUALISM

EDITED BY

Ludmila Isurin
Donald Winford
Kees de Bot

41

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Multidisciplinary Approaches to Code Switching

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Edited by

Ludmila Isurin
Donald Winford
Ohio State University, Columbus

Kees de Bot
University of Groningen

John Benjamins Publishing Company

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Introduction

Bilingual speakers are often involved in what looks like an effortless switch between the two languages that they speak. The switch can happen within the same conversational turn or when there is a shift to a different register brought about by changes in setting, interlocutor, conversational goals and other social factors. There is now a long tradition of research on code switching phenomena within linguistics, sociolinguistics, and more recently, psycholinguistics. Scholars have always envisioned the study of code switching as an essentially multi-disciplinary enterprise. In his 1953 Languages in Contact book, Weinreich, the acknowledged pioneer in the field of contact linguistics, emphasized that an explanatory framework for the study of language contact phenomena must include "purely structural considerations…psychological reasons…and socio-cultural factors" (1953: 44). He recognized that purely linguistic approaches to contact phenomena are inadequate if we are to explain the causes and consequences of such phenomena. He pointed to the need to examine, in addition, the social contexts of language contact, as well as psycholinguistic aspects of bilingualism such as a speaker's relative proficiency in each language, his ability to keep two languages apart, and the manner in which he learned each language (1953: 3). In spite of this call for an integrated, interdisciplinary approach, the unfortunate fact is, that in language behavior research there have traditionally been reasonably sharp dividing lines between linguistic, psycholinguistic, and sociolinguistic research. This is especially true of research on code switching, which has spawned a huge literature in each of the three fields. Linguists have generally been concerned only with structural aspects of code switching and with formulating constraints on it based on some theoretical model. Sociolinguists have focused on the social motivations and social correlates of code switching. Psycholinguists have concerned themselves with questions about how bilinguals' linguistic systems are stored and organized in the cognitive system, and how they are accessed in language production and perception. Each discipline has also conducted research using quite different descriptive frameworks and methodologies, with very little dialogue across their boundaries.

Recently, however, there has been an increasing trend toward crossing such boundaries and establishing an interdisciplinary perspective on code switching. Linguists such as Myers-Scotton and Jake (this volume), and their associates have attempted to explain the linguistic constraints on CS by appealing to insights from psycholinguistic models of language production. Research by Clyne (2003) has shown how structural constraints on code switching might be better explained in terms of concepts like triggering and facilitation, which are related to psycholinguistic processes of lexical selection and lemma access. Students of contact-induced change such as van Coetsem (1988) have tried to account for the mechanisms and agency involved in cross-linguistic influence by appealing to psycholinguistic notions such as language dominance and differences in degrees of activation of the two languages in the production process. Psycholinguists for their part recognize that language production by bilinguals is constrained by social factors such as the nature of the situation and participants' social motivations. De Bot's (2004) model of bilingual speech production, based on Levelt's model, explicitly includes a module that represents speakers' "situational discourse knowledge" as part of their more general declarative knowledge. A very ambitious attempt to integrate socio-pragmatic and psycholinguistic approaches to CS into a single model of bilingual speech production was made by Walters (2005). The model assumes that language production is grounded in the social world, and depends on speakers' identities, intentions, and understanding of the situations they find themselves in. These kinds of information play a key role in the language production process, from language selection to lexical access through to articulation.

While this trend toward interdisciplinary research on CS is encouraging, it is still very much in its infancy. Hence we still know very little about bilinguals' movement along the language mode continuum in their everyday life. Nor do we have a clear understanding of what factors or mechanisms motivate, trigger, or constrain code-switching (CS), nor what cognitive costs it entails. Our goal in this book is to continue and promote the developing tradition of research that crosses disciplinary boundaries, in keeping with Weinreich's astute observation that, "on an interdisciplinary basis, research into language contact achieves increased depth and validity" (1953: 4).

In December 2007, we organized a three-day workshop at the Ohio State University where the contributors to this volume got together with the goal of exchanging their views on the phenomenon of code switching, and conducting a constructive dialogue across disciplines in order to arrive at a better understanding of the process, its mechanism and causes, and the cognitive costs involved. The participants of the workshop are well-recognized scholars in linguistics, socio-linguistics, contact linguistics, psycho- and neuro-linguistics, who have done an extensive amount of research on code-switching. These three productive days of professional dialogue and subsequent work on the participants' contributions resulted in this volume. We worked on this book with the intention that readers from any related field like general linguistics, socio and psycholinguistics, contact and neuro-linguistics, as well as psychology and sociology, would benefit from it and find it interesting and easily accessible. The volume consists of 13 chapters presenting the work of the contributing scholars.

For convenience, the contributions in the volume are presented in two sections comprising psycholinguistic and sociolinguistic/linguistic studies respectively. We hope that this organization will make the volume easier to read; however, we would like to stress the fact that all authors made attempts to reach across the disciplines and discuss code-switching from different perspectives. Thus the organization of the book should not be viewed as a traditional compartmentalization of the code-switching phenomenon.

The Psycholinguistic section of the volume opens with three survey chapters that present overviews of recent developments in psycholinguistic approaches to CS. These are followed by four empirically-based studies that explore various aspects of CS from a psycholinguistic perspective. **Altarriba & Basnight-Brown**'s chapter provides an informative overview of current work in a relatively new area of research, the study of how code switched words in a sentential context are processed, interpreted, and remembered by bilinguals during reading. The authors discuss psycho-linguistic research on the processing of three types of switched words: those that have a single meaning (including cognates and non-cognate translations), homographic non-cognates or "false friends", and homonyms, that is, words that have multiple, unrelated meanings. They discuss the various experimental methodologies used in such studies, including eye tracking experiments, cross-modal priming techniques, rapid serial visualization tasks and physiological measures such as event-related brain potentials. The authors also summarize the findings of each experimental study and discuss their wider implications for our understanding of the various factors that influence how bilinguals process code switched words. The findings are then linked to two models that aim at capturing the mechanisms behind language activation, i.e., the Connectionist Model and the Bilingual Interactive Activation Model. Finally, the paper suggests a number of directions for future work in this area.

The contribution by **Meuter** presents a detailed overview of empirical psycholinguistic studies that attempt to shed light on how multilinguals optimize their language performance. The chapter focuses on the processing costs involved in switching between the languages, sensitivity and responsiveness to language-related cues, maintenance of the selected language, and inhibition of another language. The evidence for optimization of communicative effectiveness comes from trilingual speakers, and shows that speaking more than two languages is less costly, in terms of switch cost, than shifting between only two languages.

The third survey chapter, by **Van Hell & Witteman,** gives an overview of the new neuro-imaging (NI) studies that have been carried out on different aspects of CS. It can be argued that the application of new neuro-imaging (NI) techniques like fMRI and ERP presents the next stage in the study of language processing. The aim of the application of such techniques is to inform us about the time course of brain activity associated with code switching between languages. One particular issue is whether switching takes additional resources at the neuronal level and if so what part of the brain is involved in this additional processing. Much of the theorizing regarding CS focuses on cognitive control and inhibition to explain switching on the one hand, and non-switching, on the other. The use of NI techniques for bilingual processing is clearly still in its infancy and as this overview shows the findings are inconclusive in many respects though the mapping of the different sub processes and their neural substrates is promising. It is obvious that the methodology limits what can be studied.

The next three chapters in this section are primarily psycholinguistic contributions that use empirical data to test new hypotheses about CS, or suggest new approaches and models for the study of CS, which are empirically driven.

De Bot, Broersma & Isurin's contribution aims at developing a general framework for triggering in CS, based on earlier work by Clyne, and going beyond a purely lexical approach to one that investigates different types of triggers and their interaction. The paper is organized into 3 broad parts. The first part outlines the main aspects of the framework within which triggering and its effects can be analyzed and explained. There are two parts to this. First, CS is seen as a case of transition between language states similar to phase transitions of the type investigated in Physics. Second, triggering within the individual language system is placed in the context of the language production process. The key assumption of this approach is that activation of an element that is shared by the speaker's two languages in Language A will lead to activation of other elements from Language B, both within and between different levels of the production process. In the second part, the authors provide an overview of research on various kinds of shared representations between languages, which might be relevant to triggering. The possible triggers reviewed include cognates, non-cognate translation equivalents, shared syllables, concepts, syntactic representations, gestures, and sounds.

In line with the previous chapter, **Broersma, Isurin, Butlena & de Bot** explore the extent to which trigger words affect the rate of code switching at the lexical level. Their informants are Dutch/English and Russian/English bilinguals. Two patterns of code switching are analyzed: first, switching of words immediately following or preceding a trigger, and second, switching of words in the same basic clause as the trigger, whether or not they follow it. The investigation introduces several refinements to previous studies, and yields interesting findings about triggering effects on code switching. For instance, the two language pairs chosen allow the researchers to compare the ways in which cognates affect code switching between typologically similar versus typologically distant languages. Also, the study provides new information on how homophones and morphologically masked cognates affect code switching, and how they compare with cognates, particularly in the Russian/English data. After providing evidence on triggered CS at the lexical level, the authors move on to determine how trigger words produced by the interviewer may affect the code switching of the interviewee, and how discourse markers affect language choice at the lexical level. This approach has interesting implications for how sociolinguistic factors can be integrated into future investigations of this type of code-switching.

The contribution by **Kootstra, van Hell & Dijkstra** opens another new avenue to the study of CS by proposing that research should treat dialogue as the basic unit of analysis in the study of CS and interactive alignment as the main cognitive mechanism. This is a move away from both looking at individual utterances as the main unit of analysis and taking the individual language speaker as the main agent in language production. In psycholinguistic studies of CS so far, language production was seen as a process of generating intentions and turning them into utterances within the speakers' language system. Following Garrod and Pickering's 2004 claim that "humans are designed for dialogue rather than monologue" the authors claim that there are links between subcomponents of language systems of speakers in interaction and that there is priming on different levels. This also helps to solve one of the main problems in the study of CS: how is language selection organized? Rather than taking the individual's intentions as the source of selection, it is now the interactional setting which defines the languages to be used, though of course there are still instances where the initiative of language selection is still with the individual speaker.

Another innovative aspect of this approach is that it offers novel ways of manipulating experimental laboratory techniques to capture the effects of interactional factors on CS. On the whole, the approach used in this chapter recognizes that CS is an interactional strategy that speakers employ in conversation. It therefore lays the groundwork for further integration of sociolinguistic and psycholinguistic approaches to CS.

The final contribution in the psycholinguistic set of the volume addresses an important issue that is often overlooked in the CS debate, i.e., transfer and its interrelation with code-switching. **Marian** adopts a psycholinguistic approach to this issue, investigating two types of cross-linguistic influence in bilingual language production: overt influences or switches into the other language, and covert transfer of semantic or syntactic patterns but no overt materials from the non-target language. The paper argues that such influence is conditioned by both the linguistic structures of the languages involved and non-structural influences such as the context and previous language experience of the speakers. Most of the paper is concerned with structural factors such as differences between the languages in syntax, semantics, and grammatical categories, as well as with differences in the degree of concreteness manifested by different sub-classes of nouns and verbs. Each of these differences is shown to influence bilingual switching and transfer phenomena. The paper considers two competing psycholinguistic accounts of how languages interact during production. A processing-based account suggests that the non-target language influences selection of structure in the target language during lexical access, while a representation-based account argues for interference at the level of mental representation. The paper claims that structural and non-structural factors have different effects on switching than on transfer, and concludes that switching may be linked to lexical access, while transfer may be associated with the conceptual level of language production. However, the paper keeps open the possibility that both representational and processing differences can lead to both types of cross-linguistic influence, and leaves this for future research to resolve.

From the empirically based studies that look at CS from a psycholinguistic perspective we take the reader to the contributions that take a primarily linguistic or sociolinguistic perspective on CS.

Bullock & Toribio's contribution is a sociophonetic study of the production of voiceless stops by Spanish/English bilinguals. In line with several of the other contributions, they argue that the two contributing languages in a CS setting are not completely stable and unchangeable entities, but that CS itself has an impact on the languages used. They explore one specific aspect, Voice Onset Time (VOT), a variable that has been successfully examined in previous studies of cross-linguistic influences at the phonetic level. By comparing VOTs from early and late Spanish/English bilinguals in monolingual and bilingual settings they show that there is an impact on both L1 and L2 caused by linguistic-internal factors such as structural differences between languages and linguistic-external factors such as language use and perceptions of congruency. Their study supports the idea that switching can take place in only one part of the language system and does not necessarily affect all other components.

Jake & Myers-Scotton's contribution is a continuation of their well-known work on the various principles that regulate what is possible in CS. It is built on their Matrix Language Frame model of CS, which postulates that one language, the matrix language, supplies the morphosyntactic frame of a bilingual utterance, including most grammatical or "system" morphemes, while the other language, the embedded language, can supply content morphemes and certain system morphemes. The paper argues that, while content and early system morphemes as well as certain bridge system morphemes can be incorporated from the embedded language, there are strict constraints on the incorporation of outsider system morphemes. The authors suggest, briefly, that the reason for these different privileges of occurrence is that the morpheme types differ in terms of how and when they are accessed in language production. The paper tests the model and its predictions by examining the distribution of different types of embedded language morphemes in code-switching data from a wide variety of languages.

In their chapter**, Cantone & MacSwan** describe code switching patterns within Determiner Phrases (DPs) in bilingual Italian-German sentences, based on grammaticality judgments from 10 subjects and natural speech by young children. The results from both data sets provide evidence that the patterns of code switching that are judged acceptable can be explained by the fact that the language of the adjective determines the word order in mixed DPs. The paper employs the framework of the Minimalist Program to argue that the differences in word order patterns fall out from differences in the strength of agreement features between German and Italian. This paper also suggests some ways in which linguistic and psycholinguistic approaches to CS can contribute to each other.

The volume continues with the contribution by **Winford** who tries to link frameworks from contact linguistics to psycholinguistic models of language production in order to show how the same type of processes that play a role in the creation of bilingual mixed languages can be found in individual language users' CS production. In this contribution, the focus is on borrowing, a phenomenon that has led to heated debates among CS researchers. The paper argues that the mechanisms by which bilingual mixed languages arise are very similar to those that are involved in the kinds of content morpheme insertion that is found in classic CS. It attempts to explain these phenomena in terms of a psycholinguistically based notion of borrowing, which involves the agency of speakers who incorporate elements from a less dominant language into a more dominant one. One of the problematic issues raised here is to what extent linguistically-based analyses of the mechanisms of language change can be interpreted in terms of the psycholinguistic processes involved in bilingual language production. Of course, much further research needs to be done on this question.

The contribution by **Backus** shows how bridges between contact linguistics, sociolinguistics and psycholinguistics can be built in the study of CS. He argues that synchronic and diachronic approaches to language contact should seek commonalities rather than continue to stress differences in approaches and that in order to account for linguistic innovations, both synchronic and diachronic aspects of the change must be considered. The paper attempts to explain contact induced change in terms of social, communicative and linguistic factors. Social forces such as group relations and interaction set the stage for communicative choices which lead to innovations reflected in code switching practices, and such innovations spread over time, until they become entrenched as part of the grammar of the changed language. Taking the example of a specific construction: infinitive plus light verbs, in particular Turkish 'yapmak'('to do') and Dutch infinitives in Dutch/Turkish CS, he tries to show how such a CS based innovation can emerge and how it spreads through the community. He assesses different hypotheses about how various extensions in the use of *yapmak* came about. He also calls for research that seeks to provide psycholinguistic evidence for or against empirical claims about the processes of change.

The contribution by Odlin continues the debate about the differentiation between transfer and code switching from the linguistic perspective. In his work, he attempts to sort out the relationships between CS and transfer, defined broadly as any kind of cross-linguistic interference. There has been quite some debate as to whether transfer and CS are different phenomena. Odlin argues that a distinction should be made between 'Borrowing transfer' and 'Substrate transfer'. The former refers to the impact of later acquired languages on the first language, the latter to the impact of the first language on those acquired later. In his view, this is not just a matter of direction of transfer but it refers to fundamentally different issues, because they are found in different populations. There are also clear parallels between the two processes of CS and transfer: both are based on the assumption of the unitary nature of production and comprehension, and there are partly similar constraints on both processes in the sense that not everything that can transfer or be switched will. Finally the author argues for more attention to individual histories in order to learn more about dynamic patterns of change of language systems over time.

From the above brief review of the volume, it becomes clear that the contributions discuss practically every level of linguistic structure where CS phenomena can be found. These range from studies conducted at the phonetic (Bullock & Torribio), morphological (Jake & Myers-Scotton) and lexical (Broersma et al., Marian, and Altarriba & Basnight-Brown) levels to those that focus on the syntactic (Cantone & MacSwan) and discourse (Broersma et al., Kootstra et al) levels.

We hope that the contributions to this volume will confirm that the cross-disciplinary approach to CS is long overdue and highly welcomed by scholars coming from different fields. In addition to explicit calls for interdisciplinary perspectives on CS and consistent cross-referencing to other works in the volume, there are a few recurring themes in this selection of papers. The empirical studies presented here demonstrate the traditional use of experimental (Broersma et al, Kootstra et al, and Bullock & Torribio) and naturalistic (Jake & Myers-Scotton, Cantone & MacSwan, Winford) data. However, several authors (Kootstra et al, Van Hell & Witteman and Backus) address the explicit need to combine experimental and naturalistic data in order to test hypotheses and account for linguistic innovations.

Another area of concern is the linguistic modality where CS is traditionally studied, i.e. production vs. comprehension. Although most of the studies reported on here were conducted in either one of those two modes, the plea for researchers to focus on dialogue as the main form of language production is voiced by Kootstra et al., further supported by Altarriba&Basnight-Brown, and briefly discussed in their study by Broersma et al.

The contributions to this volume discuss practically every level of linguistic structure where CS phenomena can be found.

Another theme that appears in several of the contributions is the issue of possible constraints on CS and the extent to which they are predictive. Jake & Myers-Scotton's discussion of CS within the Matrix Language Frame model demonstrates the role of constraints on the incorporation of system morphemes, while Winford challenges some traditional constraints that have been proposed for codeswitching, and supports others that seem to apply more successfully. This argument is taken even further by bringing transfer to the discussion table. Odlin agues that both comprehension and production processes exhibit similar constraints on transfer and code-switching in the sense that not everything that can transfer or be switched according to the existing models will do so in practice.

A somewhat different perspective on this issue is de Bot et al. and Broersma et al. They suggest that, given how little we know about the mechanisms of CS or the structural constraints that switches obey or fail to, we should very carefully consider what may be a cause and what may be a reason for CS.

Another important theme, much discussed in both the psycholinguistic and linguistic literature, concerns the question of language activation and how it can shape CS. The contributions by de Bot et al., by Jake & Myers-Scotton and Winford all address this question. They all recognize that a crucial role is played by the notion of 'asymmetry', the finding that in bilingual speech the two or more languages do not contribute equally and in the same way to the utterances produced. What the basis is for asymmetry or dominance, the term used by Winford, is not always clear. In particular it remains unclear whether the different status and contributions of each language is a stable factor that defines the speaking style of an individual or community, or is instead a dynamic and unstable factor. The notion of asymmetry is further discussed by Meuter who gives a detailed account of how language dominance and the direction of switch determine the cognitive costs involved in code switching.

One more recurring problem identified across most of the contributions is that of terminology. We are well aware of the quite arbitrary way the major terminology in the field of CS is currently used. For example, what Odlin refers to as 'transfer' is not necessarily transfer in Marian's study, or what might be considered as 'borrowing' in Odlin's view is not termed as such by Broersma et al. In his contributions, Winford stresses the importance of consistency in the language that we use in discussing the common phenomenon of code-switching. However, instead of asking the contributors to stick to the uniform set of terminology that we would create and find appropriate to use in the volume, we allowed them to freely use the terminology that they are used to. By allowing this diversity we wanted to emphasize the need for a combined interdisciplinary approach to studying the phenomenon of code-switching.

We may never fully understand why people code-switch, what causes them to change their language in the course of conversation or why certain linguistic items fail to fall into those beautifully structured models. But we will definitely benefit from crossing the boundaries of the disciplines and studying the same phenomenon by bringing in our approaches, knowledge and our own language of academic discourse. This volume takes one more step in this direction.

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Psycholinguistic studies

CHAPTER 1

Empirical approaches to the study of code-switching in sentential contexts

Jeanette Altarriba and Dana M. Basnight-Brown
University at Albany, State University of New York

This paper will discuss various research paradigms that have been purported to demonstrate why code-switching occurs, constraints that affect the desire to switch, and other variables that influence the frequency of switching within sentential contexts. Data are reviewed with an eye towards elucidating situations in which different word types (ambiguous, unambiguous, cognate, noncognate) are processed cross-linguistically within sentences. Both behavioral and physiological data are reported. Finally, ways in which these data interface with current models of bilingual language processing (e.g., BIA+, etc.) will be explored at the conclusion of this chapter.

Keywords: code-switching, language processing, psycholinguistics, ambiguity, sociopragmatics

Introduction

Perhaps the most fascinating aspect of having command of more than one language is the fact that one can produce utterances in one language at a time and also switch between languages while maintaining functional and pragmatic clarity. That is, bilingual speakers can often switch between languages and mix languages while speaking and still be clearly understood. For example, a Spanish-English bilingual speaker may say, "Que tengas un nice day". This sentence translates into English as, "Have a nice day," or "I hope you have a nice day," and carries the same basic meaning in both forms.

While code-switching is often observed in speech production (see e.g., Li, 1996), the current chapter is designed to review the factors that influence the processing of code-switched materials while reading. A relatively new area of research, in terms of the quantity of available data, focuses on the processing of code-switched items within sentence contexts. Thus, in order to provide a comprehensive review of the extant literature and hopefully motivate continued research in this area, a primary goal of the present review is to examine the empirical data and theoretical implications of research on the processing of code-switched words – both unambiguous and ambiguous – within sentence contexts. In addition to discussing the main findings regarding this area of research, data stemming from physiological measures taken during the silent reading of code-switched materials will also be presented, though this is an area still in its early infancy. Finally, general conclusions will be drawn and discussed within the available theoretical frameworks that have been used to discuss the activation of more than one language during word recognition and word processing, and future directions in this area of research will be described with an eye towards the applications of this work in real world settings.

Naturally, one of the first questions that stems from these observations is why do bilinguals code-switch, and what is known, empirically, about the mechanisms that moderate and influence this behavior? Heredia and Altarriba (2001) explored various theoretical explanations for why bilingual speakers may choose to switch between languages. Given the rapidity with which highly familiar phrases and sentences can be produced and the amount of cognitive resources it takes to access and utter sentences like those above, it is intriguing that bilingual speakers would choose to mix languages and code-switch while speaking. Yet, there are factors that encourage the mixing of languages and in some cases may necessitate the mixing of languages in order to communicate the exact semantic message that the speaker wishes to convey. For example, switching might occur because of a lack of formal knowledge of words in the base language, that is, the language the speaker is switching *from* (Grosjean, 1982). A native Spanish speaker, for example, with limited knowledge of English may consciously choose to insert the occasional Spanish word into their utterances, in order to maintain the semantic meaning of a sentence. However, Heredia and Altarriba note that the speaker may indeed know the correct word in the base language, but simply is unable to retrieve it due to issues of frequency or competition within the lexicon, factors which are most likely due to time pressure. Even though code-switching occurs, it has been noted to be rule-governed in the sense that syntactic rules and basic grammatical structure are typically well preserved when switching occurs (but see Luna, Lerman, & Peracchio, 2005, for an example wherein certain rules are broken in order to convey persuasive messages in the domain of consumer research). Another possible reason for code switching is the idea that for some concepts, there is no exact, word-for-word translation across languages. Take for example the word "*cariño*" in Spanish. Within the Spanish language, this word carries a meaning that combines the English concepts of *liking* and *affection*, typically with a familial connotation. When asked, most proficient Spanish-English bilinguals have difficulty coming up with a single word in English that captures all of the featural and conceptual characteristics that are associated with the word "*cariño*".

In the early literature on code switching, Macnamara and Kushnir (1971) proposed an actual switching mechanism to explain the process of moving back and forth between languages. In their account, bilinguals have the ability to activate words within each of their mental lexicons. However, when one language is "on", the other may be "off," and it is the actual turning off or on of a language that incurs added processing time and slows down the recognition of mixed-language stimuli. Macnamara and Kushnir described this process as one in which there is a lower level, perceptual "input" switch responsible for initial selection of the appropriate lexicon, and a higher level, conceptual/semantic "output" switch that is responsible for the selection of a specific word or set of words that are appropriate to the context at hand. Importantly, they note that while one language is engaged, the other becomes "deactivated", as both languages cannot operate, at least within production tasks, at the same time. This type of mechanism relates quite well to the current discussion in bilingual language processing concerned with whether language access is selective versus nonselective. More will be said later concerning this issue.

While earlier accounts focused on the nature of the time involved in the switching between languages (see also Chan, Chau, & Hoosain, 1983; Kolers, 1966), recent approaches to the notion of code switching have focused on identifying the linguistic factors – properties of the languages themselves – that mitigate one's ability to switch in an efficient manner. For example, Li (1996) examined the recognition of code switched words in speech by Chinese-English bilinguals. This work examined the grammatical constraints that determine a speaker's ability to correctly recognize a code-switched word within an utterance. For example, in the English language, words can begin with both consonant-consonant structures (e.g., plan), and consonant-vowel structures (e.g., gift). However, while Chinese also allows consonant-vowel clusters, the language does not provide for the possibility of consonant-consonant structures in initial word positions. This structural difference affected the ability of Chinese-English bilinguals to recognize code switched words in English – namely, response times to "shadow" or name these words as soon as they appeared in a sentence was significantly longer when the word contained an initial consonant-consonant cluster as compared to those with an initial consonant-vowel cluster. Even though the code-switched word was indeed expected and semantically consistent with the discourse in which it was presented, the fact that it contained a structure that is not found in the native language of the participating bilinguals slowed response times to these words. This delay in responding underscores the role of phonotactic structure and phonetics in recognizing code-switched words in spoken sentences. It may be that in certain circumstances more processing time is needed in order to recognize a word whose grammatical features are quite different than those of the base language within a sentence. Heredia and Altarriba (2001) also noted the importance of semantic context, degree of phonological overlap between languages, and aspects of pronunciation/articulation in describing the influence of code-switched speech in auditory language recognition.

Code-switching involving unambiguous words

Although a wealth of information exists on the processing of words in isolation, the study of how words within sentence contexts are processed, interpreted, or remembered, particularly for bilingual speakers, is quite sparse. In their volume entitled *Bilingual Sentence Processing*, Heredia and Altarriba (2002) attempted to bring together works that summarize the extant knowledge of the field of linguistic processing of contextual information for speakers of multiple languages. Yet, even within such a comprehensive volume, it is clear that specific work on *code switching* within sentence contexts is quite limited, as most of the work reviewed in the above volume focuses on how bilinguals process materials in a single language. That focus is clearly patterned after the fact that this type of work represents the vast majority of the extant work in the area of bilingual sentence processing. In contrast, the works reviewed below are aimed towards the processing of materials that clearly combine more than one language within sentences. The current section focuses on investigations of the representation and processing of code-switched words within sentence contexts that are unambiguous in nature (i.e., words that are generally understood to have a single meaning within and across languages).

Most researchers would agree that the processing of a sentence involves an incremental approach to understanding the meaning and the form of a sentence (Williams, 2006). For example, as one reads each word starting from left to right in English, one develops certain semantic expectations for each word that is to follow while simultaneously applying a syntactic structure that also produces a set of constraints for how the sentence could progress. Therefore, there are expectations as to which words are likely to appear as one proceeds through the reading of a sentence (see e.g., McDonald & Shillcock, 2003, for further evidence of the role of predictability in on-line reading measures). In cases where the syntax and semantics appear to converge on a set of familiar expectations, the sentence is said to be of high constraint. For example, "*Agnes walked to the mailbox to retrieve her mail*." In contrast, when the sentence does not at first seem to specify an expected message and set of expected syntactic structures, the sentence may be termed a low constraint sentence. For example, "*Agnes walked into the store to buy wallpaper*." The key factor in the processing of sentences, again, is to note that those structures and expectations develop incrementally as a sentence is read from left to right. Readers consider the plausibility of certain expected words or phrases within a sentence, and the tendency is to place the more plausible expectations first in the process of interpreting a sentence. However, there are often situations in which the initial "set up" that provides for an expected word or phrase is found to be incorrect, causing a delay in the processing of the entire sentence and sometimes, the need to return to earlier portions of the sentence in order to clarify its meaning.

Williams (2006, Experiment 2) examined the processing of English sentences by native and non-native speakers of English. The non-native speakers in this study were described as graduate students who had successfully completed the Cambridge Certificate of proficiency in English, and who were "linguistically functional in an academic environment." The non-native speakers were native speakers of 16 other languages including Chinese, German, Greek, Russian, and Singhalese, just to name a few. Participants were instructed to read a question probe followed by a sentence requiring a final word completion. For half of the sentences, the missing word was the direct object of the verb (e.g., *Which bucket did the lady wash the very large shirt in early this morning*? *The lady washed a* _____). For the other half, the missing word was a noun from an adjunct phrase presented within the probe question (e.g., *Which baby did the boy drop the very small toy on just after lunch*? *The boy dropped the toy on the* _____). The results indicated that the native participants were more accurate than the non-native participants in both conditions. That is, the percentage of correct sentence completions for the native participants was higher in each condition than for the non-native speakers. However, both groups differed in terms of their timed reading of the probe questions. Non-native participants showed a significant delay in reading time for the second question type noted above, as compared to the case in which the direct object formed the correct completion. In other words, non-native participants took more time in comprehending the structure of the questions that were seemingly more "implausible" than those in the first example. Williams later examined the data with regards to individual differences in memory and noted that the results often varied within each participant group, as a function of individual memory span and other task demands.

Findings such as those reported by Williams (2006) indicate that linguistic properties (i.e., structural and syntactic rules) of a bilingual's first language can influence how they read in a second language. When participants are quite well-versed in the syntactic structures that are common or otherwise typically expected within a language, they can interpret consistent information with relative ease and sometimes, adjust their expectations when seemingly implausible structures are encountered. In contrast, the non-native speaker may require more time to readjust their parsing strategies in situations where the plausibility of a sentence is rendered highly unfamiliar or unexpected, likely due to overall inexperience with the non-native language. What may be of interest to future researchers examining these specific paradigms is the influence of using mixed-language stimuli and examining the relative influence of the location of the mixed-language item with regards to rendering a sentence plausible or implausible. Yet, an important feature of this work for the current discussion is to note again, that sentence comprehension is driven by a certain amount of expectation that builds at a variety of levels – lexical, syntactic, semantic – as one processes written sentences. The works that follow further examine the influence of sentence constraint on comprehension and processing, but with an eye towards the interaction between the various levels of language representation and degree of sentence constraint.

Altarriba, Kroll, Sholl, and Rayner (1996) published the first study that examined the processing of mixed-language sentences during silent reading using the eye tracking methodology. They examined the degree to which sentence constraint effects, as described in the earlier examples of high and low constraint sentences, are moderated by semantic features, lexical features, or both. Earlier work by Schwanenflugel and LaCount (1988) suggested that sentence constraint effects (i.e., facilitation in processing final words that appear in sentences of high constraint versus sentences of low constraint) are influenced primarily by semantic or conceptual representations that are accrued as one reads a sentence from beginning to end. They found that participants were slow to make lexical (i.e., word-nonword) judgments to words that were semantically related to the expected word within a sentence. For example, for the sentence frame, "*The landlord was faced with a strike by the* _____", reaction times were slower when the final word *residents* appeared at the end of the sentence, as compared to the word *tenants*. These results were explained by a feature restriction model that suggests that high and low constraint sentences differ on the number of feature restrictions that are generated, as a sentence is processed from beginning to end. Readers generate a larger number of feature restrictions for high constraint sentences as compared to low constraint sentences. In the case of highly constraining contexts, the feature restrictions typically lead readers towards a single word as an expected completion. If a word appears that does not match that expectation, a delay in processing of that word occurs. Facilitation occurs only for those words whose semantic features match those generated by the preceding sentence context. However, while semantic features appear to play a role in processing sentences of varying degrees of constraint, do other variables (e.g., lexical features) also moderate the processing of these types of sentences?

Altarriba et al. (1996) sought to examine the above question by capitalizing on the fact that a single semantic representation can be represented by two distinct lexical entries – one in each of two languages. Thus, they used a bilingual approach to examine the degree to which features other than those that are semantic or conceptual in nature influence the processing of sentences. Fluent Spanish-English bilingual participants viewed English sentences of both high and low constraint, each containing a target word, as their eye movements were recorded. An example of a high constraint sentence is, "*Mark had a table and a chair in his small office*". A low constraint sentence was also used that included the same target word, "*The blue and white chair was his favorite piece of furniture*". In the code-switched conditions, the word "*chair*" was replaced with the Spanish translation, "*silla*", while in the non-code-switched conditions the sentences were homogenous in terms of language. The participant's task was to silently read these sentences, one at a time, on a computer screen, while their eye movements were recorded.

The results of the above study indicated that first fixation times were longer in the code-switched conditions as compared to their all-English controls, specifically for high constraint sentences. That is, participants expected a specific lexical form, and the fact that the code-switched word satisfied the semantic expectations built up during the reading of the sentence was not sufficient to facilitate the reading of the target word. The expectations were also *lexical* in nature. In a second study, Spanish-English bilinguals were required to name the target word aloud when it appeared on a computer screen, as the sentence was presented one word at a time using the rapid serial visual presentation (RSVP) procedure (Altarriba et al., 1996). The results were analogous to those reported in the eye movement data – naming times were slower for code-switched target words that appeared in high constraint sentences. Thus, in cases where a sentence is highly constrained, expectations appear to be strongly built up within a single language – the base language of the sentence. In contrast, when a sentence is not strongly constrained or contextualized, the processing of code-switched words that preserve the semantic features that are built up from the preceding context is not hindered. A simple switch of language does not appear to disrupt processing under those conditions.

The eye tracking methodology was also used to examine the nature of parafoveal preview effects in reading code-switched sentences in a subsequent series of studies. Readers not only process information from the word or location on a word where they are currently fixating, but also from words that appear in the parafovea, or just outside of that point of fixation. These studies examine the influence of the material that is in the parafovea on the processing of information that is directly at a point of fixation. Altarriba, Kambe, Pollatsek, and Rayner (2001) reported the first, and to date the only study, that examined the degree to which both semantic and lexical constraints influence the degree to which information from the parafovea influences eye movements in reading, using cross-linguistic materials. It had been reported in the monolingual literature that the nature of an item presented as a preview prior to the processing of a target stimulus could facilitate or hinder the processing of the target (see e.g., Inhoff, Starr, & Shindler, 2000). For example, fixation times to the target word "chest" are reduced when preceded by items such as "*chest*" or "*chovt*" when such items are presented parafoveally, as the eyes move towards the target word on a computer screen. These preview items share physical similarity with the target word, whereas items that do not share a high degree of overlap (e.g., *ejovf*) do not produce facilitation in reading (Rayner, 1978). In fact, semantic overlap between a preview item and a target word (e.g., print-write) does not produce facilitation, within languages (Rayner, McConkie, & Zola, 1980). However, using a strictly monolingual paradigm does not permit the investigation of situations in which the overlap can be both semantic and lexical (e.g., cognates), as compared to those that are semantic and not lexical (e.g., noncognate translations). If both monolingual and bilingual readers show benefits for the processing of cognates (e.g., *cream-crema*), it would suggest that physical similarity is the sole feature that produces parafoveal preview effects. However, if semantic information is extracted during the preview presentation, then bilinguals should show greater benefits in processing the target word as compared to monolingual participants. Further, this finding would indicate that some semantic features are indeed extracted during the presentation of previewed items in the parafovea. In addition, bilingual participants would also show some benefit in the noncognate condition (e.g., *witch-bruja*), as compared to monolingual speakers, if indeed semantics plays a role in this effect.

Altarriba et al. (2001) presented Spanish-English bilingual participants who were more dominant in English than in Spanish with a series of sentences in which a preview word was replaced by a target word when the reader's saccade (i.e., rapid shift in eye movement) crossed a boundary while reading the sentences. For example, the word "*dulce*" in the following sentence was replaced by its translation "sweet" as a specific boundary was crossed: *The chocolate cake was very dulce and much too high in calories*. Both cognate and noncognate conditions were included. The results indicated that there was no additional benefit in situations in which semantic similarity was also present across words; that is, it appears as though semantic integration does not occur across fixations in these types of tasks. Results were similar for both monolingual and bilingual participants. However, the bilingual paradigm provided a stronger, more sensitive test, of the role of semantic features in the processing of parafoveally presented stimuli than had previous paradigms. At least in these particular tasks, it appears that semantic information is not captured in the processing of information that is presented during a saccade and that physical similarity appears to be the most significant factor in producing target word facilitation. Future research should be directed at exploring the degree to which the relative proficiency, age of acquisition, and fluency of the bilinguals being tested could moderate the ways in which semantics might influence the nature of sentence processing in these types of eye tracking paradigms.

Cross-modal paradigms have also been used to examine the degree to which code-switched stimuli influence sentence processing. Hernandez, Bates, and Avila (1996) examined cross-language processing by using the cross-modal priming technique. It has been reported that the processing of a target word such as the English word "*war*" occurs more quickly when preceded by a related word in a second language such as "*paz*" (the Spanish word for *peace*) as compared to an unrelated control such as "*boca*" (the Spanish word for *mouth*) (see e.g., Altarriba & Basnight-Brown, 2007). These cross-language priming effects can also be demonstrated when the prime is presented auditorily within a sentence context and the target appears visually for a lexical decision response. The code switching here occurs from the language of the prime, within a sentence, to the language of the single target word. In the non-code-switched conditions, the language of the sentence is the same as that of the target. Prior to this work, priming effects had been investigated within a single modality, and researchers had not investigated the effects between languages from a sentence to a single word. Thus, this work attempted to generalize the typical cross-language priming effects to a new linguistic paradigm. The basic assumption that is touted to drive priming effects across languages is the fact that conceptual or semantic information is often shared across languages of a fluent bilingual. To the extent that there is semantic overlap across languages, one would expect facilitation in the processing of a target word when preceded by a related prime.

Hernandez et al. (1996) presented Spanish-English bilingual speakers with auditory sentences, and at a predetermined location, the sentence stopped and a visual target word appeared. The participants' task was to name the target word as quickly and as accurately as possible. Sentences and targets were either the same language (English or Spanish), or the language of the target word differed from the language of the prime sentence (English-Spanish or Spanish-English). For example, for the prime sentence, *The number of vehicles and people that move about a city in a course of a day can be quite large*, the word "*ciudad*", the Spanish translation for *city*, would be presented visually instead of the word city, in a cross-language condition. Sentences were always presented auditorily, and targets were presented visually. Facilitation in naming of the target word occurred in the within language conditions; however, facilitation occurred in the between-language conditions only when responses were delayed. That is, in cases in which participants were asked to wait for a cue before responding, cross-language facilitation was significant. Participants provided evidence of semantic and lexical facilitation across languages only when a sufficient amount of time was provided to actually access and integrate the cross-language target word into the sentence context. The authors concluded that, "cross-language priming appears only when participants know what language to expect, when they have ample time to generate a response, or both" (p. 860). These results indicate that at least for this group of bilingual participants, the accessing of cross-language materials takes time, as evidenced by the fact that switching costs have been documented to occur in cases of code-switching (e.g., Macnamara, 1967, see also Meuter, this volume).

In a different approach to the processing of sentences, it has been reported that the presence of code-switched items does not hinder performance in recall from memory. Repetition blindness (RB) is the term used to describe the inability to recall a repeated word in a rapid serial visual presentation (RSVP) task (see e.g., Kanwisher, 1987). For example, if a participant is shown the following sentence at a rate of 120 milliseconds (ms) per word, *I like steak but this steak tastes awful*, recall for the second presentation of the word "steak" is significantly lower than recall of the same word in the sentence, *I like meat but this steak tastes awful.* Kanwisher discussed this finding in terms of the token individuation hypothesis. While both instances of the word "steak" in the first sentence are of the same type (i.e., a cut of meat) they are not being processed as separate tokens (i.e., different instances). Thus, the visual system may have difficulties in identifying two separate presentations of the same word, given the amount of processing time involved. Typically, participants report a grammatical construction in their recall of the first sentence type; however, they simply omit the second repetition of the word. Thus, a typical response might be, *I like steak but this tastes awful.*

Researchers had concluded that the effect was likely operating at a pre-semantic level, as words that shared lexical overlap produced this effect while words that merely shared semantic or conceptual overlap (e.g., synonyms) failed to produce this effect (see e.g., Kanwisher & Potter, 1990). Altarriba and Soltano (1996) introduced the use of code-switched words in the RB paradigm to investigate the role of semantic processing in mediating this effect. They argued that synonyms (e.g., pupils-students) may not have sufficient semantic overlap to produce the effect in contrast to translations (e.g., table-*mesa* (Spanish translation)) where the connotations and denotations of each word, as well as their overall semantic strength, may be much closer particularly for fluent bilinguals. That is, cross-language translations, particularly for concrete words, may share more overlap in meaning than within-language synonyms (see Basnight-Brown & Altarriba, 2007b, for rating data that support this hypothesis).

Altarriba and Soltano (1996) presented Spanish-English bilinguals with sentences such as the ones above, only the language within each sentence switched mid-sentence. Thus, for example, the first half of the sentence appeared in English while the second half appeared in Spanish. The reverse occurred, as well. In this way, the critical target word appeared in both languages within the same sentence context. On control trials where the word was unrepeated, a related word was used that was consistent with the language of the first part of the sentence. Sentences were presented using the RSVP paradigm at a rate of 117 ms per word. The results revealed no significant repetition blindness for these cross-language sentences. Thus, it appears that conceptual or semantic relatedness alone is not sufficient to produce this effect across languages. Moreover, these results indicate that fluent bilingual speakers are not hindered by the inclusion of code-switched words presented in very rapid visual streams. Interestingly, in a second experiment in which the code switched words were embedded in short lists of seven items presented at a rate of 125 ms per item, memory for translations was actually significantly better than for same language repetitions. That is, not only did these translations fail to produce RB, they produced a priming effect that lead to better recall for these words. In summary, the repetition of translations within sentences appears to provide a situation in which both words are well recalled and the fact that a language switch occurs does not seem to hinder recall performance. Moreover, when these words are presented in simple word lists, they seem to improve overall recall, as their saliency in each language actually creates a situation in which each word is seen as a separate token or instance of the same basic concept. In contrast, within-language word lists produce the basic RB effects that are typically reported in the literature. MacKay, James and Abrams (2002) reported somewhat similar findings in a more recent investigation of the above effects. Similar cross-language effects have emerged through use of a related paradigm to examine what is known as an "attentional blink" (see Colzato et al., 2008, for further discussion).

More recent attempts at understanding how code-switched material is processed in sentential contexts has been directed towards understanding whether or not language access by bilinguals is selective (i.e., the language systems operate independently) or non-selective (e.g., lexical, phonological, and semantic information from words in both languages are active at the same time). Therefore, the central question that is raised is as follows: Can processing information in one language operate independently of a bilingual's knowledge of a second language? As described earlier in the work by Williams (1996), non-native speakers of English, who are nonetheless fluent in English, often show activation of their first language when operating in their second language. Regardless of the native language, there appear to be certain aspects of language in English, be it syntax, structure, or phonetics, that provide a grammatical basis for interpreting information in any new language (see e.g., Li, 1996). In essence, a non-selective mode of language processing would imply the existence of interference between languages and occasions where that interference is produced in a somewhat automatic fashion (see e.g., evidence of cross-language Stroop effects in Altarriba & Mathis, 1997). Duyck, Van Assche, Drieghe, and Hartsuiker (2007) investigated the degree to which the language of a sentence actually restricts a reader to a specific set of language expectations, as it guides readers to perform a lexical search solely in that language. Specifically, their focus was to examine whether or not the linguistic context of a sentence serves to "nullify" the activation of lexical representations in a bilingual speaker's alternate language. If this is indeed the case, the authors argued that basic reading in everyday activities would indeed be guided by language-specific principles indicating that language processing is selective in bilingual speakers.

Duyck et al. (2007) presented Dutch-English bilinguals who were dominant in Dutch, a series of English sentences at a rate of 700 ms per word. The sentences contained a final word that was either a cognate or a noncognate. For example, the sentence *Lucia went to the market and returned with a beautiful cat* was an instance of a sentence whose final word was a cognate. In the noncognate condition, the word "cat" was replaced with the word "bag". Only sentences of low constraint were used in an effort to capture basic processes in sentence processing that are not semantically constrained in any artificial way. Participants heard a beep just prior to the presentation of the final word indicating that they needed to make a lexical decision to that word. Findings indicated that reaction times to cognates were indeed faster than to their noncognate controls. Moreover, in cases in which the cognates were identical in terms of their overlap, the effect was even greater. Thus, having a representation for the cognate word in the first language played a role in the processing of the word in the second language. In other words, activation of the first language occurred even when the task did not require access of first language information.

What is perhaps most interesting about Duyck et al.'s (2007) finding with regards to the current discussion is that one can consider the cognate word appearing at the end of the sentence as, in essence, the "code-switched" word. In fact, the switching of languages can be viewed as having occurred as an instance of switching between lexicons or language stores (i.e., the separate mental dictionaries that exist for each language as compared to the shared conceptual store) as the cognate was processed. This switching was involuntary and non-selective as again, the task did not require use of the first language. What remains to be investigated here is whether or not this effect would occur with sentences provided in the first language with second language, final word completions. This type of investigation would indicate whether or not the notion of non-selective access is driven by language dominance and/or age of acquisition, or whether it is merely a property of having any quantity of knowledge in more than one language.

Code-switching for ambiguous words

While the work reviewed previously focused on words that had a single meaning that is shared across languages, the work in the current section focuses on the processing of code-switched items that are ambiguous in terms of their meaning (e.g., homographic noncognates, also referred to as interlingual homographs or "false friends"). Code switching implies a change in the language of a word or phrase. However, that change may be solely semantic, lexical, or both semantic and lexical. Ambiguous cross-language words provide a situation in which there is often complete lexical or orthographic overlap but absolutely no semantic or conceptual similarities between words. For example, the word "*pie*" in Spanish means *foot*, while it is a word that represents a baked product typically eaten for dessert, in English. This homographic noncognate preserves orthographic form across languages, while denoting vastly different semantic meanings, in each language. Fewer than a handful of studies have examined the processing of these words as related to sentential contexts, and those works will be reviewed in the present section along with discussion of the implications of these results.

Altarriba, Carlo, and Kroll (1992) examined language representation in bilingual memory by using words that are semantically ambiguous across languages. The question of whether or not we automatically retrieve all of a word's meanings has profound consequences for modeling language processing (see e.g., Altarriba & Gianico, 2003 and Simpson & Kruger, 1991, for further discussion). The aim of the work reported by Altarriba et al. (1992) was to investigate the degree to which a single orthographic representation leads to the access of two distinct meanings in two different languages. A debate existed earlier concerning the manner in which lexical items of this type are accessed by bilinguals. Gerard and Scarborough (1989) have argued that these words are accessed in a language-selective manner. They found that speed of recognition of homographs was determined only by the frequency of the word in the target language and not by its familiarity in the non-target language. In contrast, Beauvillan and Grainger (1987) suggested that both meanings of homographs are accessed and that frequency rather than language determines the order of access for these words. In both studies, homographs were presented in isolation for lexical decision, a task that minimizes the role of conceptual activation in processing (see also Broersma et al., this volume).

Altarriba et al. (1992) attempted to distinguish between these two positions by embedding cross-language homographs in English and Spanish sentences that biased the alternate language meaning of the homographs. Participants were presented with these sentences in an RSVP task at a rate of 150 ms per word and were asked to name the homographs aloud as quickly and as accurately as possible. The target word always appeared in uppercase. For example, the sentence, *We knew the* *play had reached its FIN when we saw the curtain fall*, includes the word "fin" whose translation in English is the word "end" – a suitable word within the sentence context. Naming times for "fin" were compared to naming times for the word "ram" (i.e., a neutral control word in English matched on frequency and length to the homograph) in the following control sentence, *We knew the play had reached its RAM when we saw the curtain fall*. If lexical access for cross-language homographs is language selective, then performance should not be influenced by the alternate language meaning supported by the context. However, if participants access both language meanings of the word, naming latencies for the homographs should be slower than those for the matched controls.

The naming data indicated that latencies were longer for ambiguous words in English contexts (the nondominant language for these bilingual participants) as compared to matched controls. It appears that when processing words in the nondominant language, information is accessed from the first language, in a non-selective manner, influencing overall naming times. Thus, when processing sentences in the nondominant language, it appears that bilingual speakers access both meanings of the homographic noncognate indicating that to some extent, lexical access can be viewed as dependent not only upon context, but also upon the linguistic dominance of the lexical representation. Again, as in the work by Duyck et al. (2007) discussed previously, one can consider code switching to have occurred as participants processed sentences in their nondominant language and the "language switching" occurred autonomously as the critical target word was processed. Thus, this work further supports the notion that lexical access of homographic noncognates is not determined solely by language mode. An implication of the current study is that processing cross-language ambiguity in bilinguals may be influenced by both language dominance and contextual constraint.

Schwartz and Kroll (2006) recently performed a series of studies that were similar to those reported by Altarriba et al. (1992). They investigated the influence of the first language on the processing of ambiguous stimuli within sentences in English – the nondominant language for their Spanish-English participants. They again asked whether or not sentence processing in a single language occurs in a language selective manner devoid of the influence of the other, more dominant language. Target words included Spanish-English cognates such as the word "*piano*", as well as a series of homographic noncognates such as the word "*fin*". Matched control words were also created as noted in the previous example above. Sentences were of either high or low constraint, that is, the sentence frame that preceded the target word was biased towards one or the other meanings of the target word. As in Altarriba et al. (1992), participants were instructed to name the target word as quickly and as accurately as possible, as soon as it appeared on the computer screen. Target words in the present study appeared in red.

Schwartz and Kroll (2006) reported no evidence of cross-language influence when processing English sentences that contained homographic noncognates. It appears as though sentence processing occurred in a highly selective manner with no detectable influence from the other language meaning of the word. In contrast, it was reported that cross-language influences did moderate naming times for cognates, only in cases where the sentences were of low constraint. According to the authors, the fact that the homographic noncognate condition did not reveal activation of the alternate language meaning of the critical target words may have been due to the high degree of proficiency participants had in both of their languages. In contrast to the results reported by Altarriba et al. (1992), the participants here were reported to have been highly proficient in both Spanish and in English and therefore, were able to process sentences in English in a functionally, monolingual mode. In a second study reported by Schwartz and Kroll, participants who were much more proficient in Spanish than in English did produce an effect with both cognates and homographic noncognates. That is, for this population of bilinguals, living in Spain, there was a clear influence on naming times for ambiguous words embedded in the nondominant language (i.e., faster naming times) than for their matched controls. In this case, knowledge of the first language actually sped up processing of words in the second language. Note that while processing time was facilitated in this case, the earlier work of Altarriba et al. (1992) indicated slower response times for those words. The difference lies in the fact that in the present case, the sentences were congruous in English, while results from the Altarriba et al. (1992) investigation stemmed primarily from sentences that were somewhat incongruous. Overall, however, the important point is that across both sets of studies, evidence exists to indicate that when bilinguals are processing sentences in a given language, it is possible to have activation of a second language to occur in an autonomous, nonselective fashion.

The processing of homographic noncognates has also been investigated using physiological measures (i.e., event-related brain potentials or ERPs), as well as the lexical decision task. Elston-Güttler and colleagues (Elston-Güttler, Gunter, & Kotz, 2005) presented native German speakers, who had intermediate or advanced knowledge of English, a series of English sentences followed by target words to which lexical decision responses were required. For example, for the sentence, *The woman gave her friend a pretty gift*, the target word was the word "*poison*" (a word meaning *gift* in German, or a harmful product in English). In the control condition, the word "*gift*" was replaced by an unrelated word such as "*item*". Additionally, participants either saw a 20-minute narrated film in German or in English, prior to completing the task. The purpose for showing the film was to create a "global language context" that could potentially carry over onto the sentence reading task and potentially moderate ERPs as well as lexical decision response times.

The results revealed significant cross-language priming effects in both response latencies and modulations in the N200 and N400 components only for participants who viewed the German film. The authors noted that participants had difficulty "zooming in" on the English language material, after having been exposed to the German language film. Elston-Güttler et al.'s data further indicated that in conditions in which the language of the film matched the language of the sentence task, participants showed no measurable influence of the first language, German. Thus, task demands and "linguistic mode" may affect the degree to which influence from a bilingual's alternate language affects processing within a target language, even when the target language is the nondominant and presumably the more vulnerable of a bilingual's two languages.

Another type of ambiguous word includes the homonym – a word that has multiple, unrelated meanings. For example, the word "*deck*" in English can either mean a flat structure similar to a patio or top floor of a ship, or, it can mean a stack of playing cards. In addition, one could use this word as a verb, meaning to "*deck*" someone or physically hit a person in some fashion. Elston-Güttler, Paulmann, and Kotz (2005) investigated the processing of these word types across languages using items such as the German word "*Kiefer*" that has two distinct semantic translations in English, the words "*pine*" and "*jaw*". They sought to uncover whether or not knowledge of the German translation for these words would affect processing in English even when participants have no reason to activate their knowledge of German. Participants were native German speakers with either high or low proficiency in English. As in the work of Elston-Güttler, et al. (2005), participants viewed sentence primes and were asked to make lexical decisions to target words as quickly and as accurately as possible. The sentences were presented in English, and the final word in the sentence was either related or unrelated to its translation in English. Thus, for the sentence, *The sticky candy stuck together his jaw,* a related target word would be the word "pine". In the unrelated condition, the word "jaw" within the sentence was replaced by the word "teeth". Reaction time data indicated that participants who were highly proficient in both languages showed no significant priming effects when processing items fully in English. They were able to operate in a selective and focused manner within the English language. In contrast, for participants who were more dominant in German than in English, the influence of their knowledge of German produced slower responses in the related conditions as compared to the unrelated conditions. The authors interpreted these data as evidence that the stronger, more dominant first language, German, was activated when processing these ambiguous, cross-language homonyms and that the activation of that information interfered with lexical decisions for the less proficient bilinguals. These inhibitory effects, or "reverse priming" as described by the authors, were also visible in the N200 component of the ERP data, once again, only for the less proficient bilingual speakers. Interestingly, the authors also noted that the fact that the N200 component revealed significant effects and not the N400 component, indicates that the locus of the inhibition was likely due more to orthographic or lexical influences than to semantic influences. In other related work, Elston-Güttler and Friederici (2005) reported that there is a time course that describes the degree to which native and non-native speakers of a language show influence from the dominant language. Though results related to reaction time and ERPs indicate that early in processing, the activation of the dominant language information influences processing, it appears to do so less often at later stages in processing (manipulated using shorter or longer stimulus onset asynchronies, SOAs, between sentences and targets). Thus, it appears that the influence of the more dominant language occurs under certain time constraints and in situations wherein processing influences can occur in a more automatic fashion (see also Elston-Güttler & Friederici, 2007, for an account of similar findings).

Conclusions and future directions

In conclusion, the current chapter summarized recent findings in the domain of bilingual sentential processing, specifically, how code switched words with single and multiple meanings across language are processed in sentences that vary in level of semantic constraint. In many ways, the overall findings appear to replicate the typical trends that have been observed in single word processing by bilinguals, such as nonselective activation of both languages, or rather, the influence of the "irrelevant" language or language not in use being activated to some degree. Although the body of literature examining sentential processing is smaller as compared to that of single word recognition in bilinguals, it can be argued that these findings are perhaps more interesting or possibly capable of shedding more light on bilingual processes because the processing of sentences and longer utterances in a language (as compared to single words) is more similar to natural language use. Thus, some would argue that the study of code-switching within sentences as compared to the study of words in isolation may be more ecologically valid. In addition, it is within sentence structures that bilinguals tend to code-switch and incorporate words from their other language. As discussed in the beginning of this chapter, there are multiple reasons as to why bilinguals code-switch, ranging from the lack of an appropriate word or translation in one language, to proficiency influences and the fact that the correct word may be unknown or of lower frequency in the base language. Moreover, in contrast, some individuals may actually code-switch on a word-to-word basis, that is, in short phrases, rather than within complete sentences. Thus, code-switching and the ways in which individuals code-switch may vary ostensibly due to the pragmatic uses of the languages, dialectical preferences, colloquial uses and the like (see e.g., Callahan, 2004, for further discussion on actual distinctions between different corpora devised from code-switching behavior).

In the present chapter, a summary of how unambiguous words (i.e., words with only one meaning across languages) are processed in sentences revealed that semantic and lexical factors are both influential. For example, data from Altarriba et al. (1996), using eye tracking methodology, indicated that code switching in high constraint sentences elicited longer fixation times as compared to low constraint sentences. The difficulty in processing code-switched items in highly constrained sentences suggests the involvement of a semantic component in bilingual sentential processing. However, the same study also reported that responses to code-switched sentences were slower overall, revealing the importance of a lexical component as well. Furthermore, RSVP data also support the idea that *both* semantic and lexical representations influence sentence processing. Data obtained by Altarriba and Soltano (1996) revealed that Spanish-English translations presented in a sentence were remembered better than same language repetitions within a sentence, suggesting that semantic relatedness is not solely responsible for repetition blindness effects.

In addition to the processing of unambiguous words, ambiguous words across languages, specifically homographic noncognates, were also examined. Because these items share orthography across languages, but differ in their semantic representations, they are extremely useful in exploring whether bilingual language processing is selective or nonselective. Whereas earlier research on bilingual language processing suggested that only one language is activated at a time, and that the language not in use is "turned off" in a sense, much of the research in the past decade has increasingly supported the idea that lexical entries in both languages are activated, even those that are "irrelevant" or "inappropriate". In single word recognition, simultaneous activation of both of a bilingual's languages has been observed in visual word recognition, where multiple meanings for homographic noncognates (i.e., "false friends) have been shown to be activated to some degree (Sánchez-Casas & García-Albea, 2005), as well as simultaneous orthographic representations in both languages (as evidenced by the activation of orthographic neighbors in the irrelevant language) (de Groot, Borgwaldt, Bos, & van den Eijnde, 2002; Jared & Kroll, 2001; van Heuven, Dijkstra, & Grainger, 1998). Furthermore, nonselective activation of phonological components in both languages has also been reported in a series of creative experiments involving auditory word recognition (Marian & Spivey, 2003; Spivey & Marian, 1999; Weber & Cutler, 2004).

In addition to the growing body of research supporting nonselectivity in bilingual language processing, the question naturally arises as to whether the processing of code-switched words, particularly ambiguous words, in sentence constructs occurs in a similar manner to that of single word recognition; or, whether sentence processing is different in that the language of the sentence restricts or "filters out" lexical candidates from the language not in use, such that those lexical entries are never activated at all. Even though the number of studies examining ambiguity and bilingual sentential processes are few in number, the data reviewed in the current chapter suggest that multiple meanings across languages *are* activated when reading sentences (Altarriba et al., 1992; Schwartz & Kroll, 2006). Altarriba and colleagues observed inhibitory effects when the multiple meanings of homographic noncognates were activated, while Schwartz and Kroll (2006) observed facilitatory effects as a result of nonselective activation of the multiple meanings. Although this difference is purported to arise because of the different types of sentences used across the two studies, of main interest to the current discussion is that, analogous to single word recognition, bilingual sentential processing also appears to be nonselective (as least at early stages of processing).

Theoretically, the data from bilingual sentential processing appear to support a type of connectionist modeling, whereby semantic and orthographic factors converge to determine how quickly words are processed (e.g., the influence of both semantic and lexical variables in eye tracking data obtained by Altarriba et al., 1996, for unambiguous words). More specifically, the nonselective processing reported in those studies that examined ambiguous words appears to be in line with the assumptions posited by the Bilingual Interactive Activation Model (BIA, BIA+; Dijkstra & van Heuven, 1998, 2002). According to this model, a bilingual's two languages are represented in an integrated lexicon where activation of a word in one language activates lexical entries that are similar in the other language (they may be orthographically similar, phonologically similar, etc.). As a result of this nonselective processing, the semantic meanings of both lexical entries are activated, even those that are irrelevant or inappropriate in the current situation. In the numerous findings that have been summarized in the current chapter, it is evident that code switching in sentential contexts certainly follows the pattern of nonselective processing that has been reported in the single word recognition literature. According to the BIA model, activation is bidirectional such that top down (contextual) and bottom up (feature characteristics) influence which items become active. It is the top down processes that are responsible for inhibiting words from the language that is not in use (see further discussion of this model in Basnight-Brown & Altarriba, 2007a).

Although the BIA model was originally designed to explain single word recognition, given the recent findings from sentence processing, one could argue that the BIA model can be expanded to explain certain outcomes observed in bilingual sentential processing (as suggested by Altarriba & Gianico, 2003, and, Gianico & Altarriba, 2008). Specifically, the BIA model states that activation can be influenced by context, one of the factors that also appears to play an important role in the presence or absence of nonselectivity in sentence processing. For example, given the findings reviewed in the current chapter, there are situations where processing is more *situation-specific* (i.e., high versus low constraint sentences) – a factor that can be used to determine whether or not outcomes from the sentence data deviate from those reported in single word recognition. For example, Elston-Güttler, Paulmann, and Katz (2005) have shown that sentence context and constraints (i.e., specifically the absence of nonselective activation in high constraint sentences), as well as the role of time course in processing (i.e., later processing stages), can reveal whether or not irrelevant meanings are activated. For this reason, it has been suggested that this model should be modified or expanded to include more details on the specific mechanisms involved that are responsible for how sentence context influences lexical access (Schwartz & Kroll, 2006).

The area of research that encompasses the study of code-switching and sentential processing in bilingual speakers is poised for a broad range of future research directions, both basic and applied. As research in this field continues to grow, several key questions remain to be explored. For example, what might be the relative influence of second language information on processing sentential information in the first? That is, some of the work explored by Elston-Güttler and colleagues (e.g., Elston-Güttler et al., 2005) and Duyck and colleagues (e.g., Duyck et al., 2007) can be extended to explore processing in the first language and the relative influence of the second or lesser known language on processing in that first, more dominant language. Further, the work involving the collection of eye tracking and ERP data can be expanded by exploring varying levels of proficiency in each of a bilingual's two languages, the influence of different languages per se (e.g., alphabetic vs. nonalphabetic, for example), the age of acquisition, perhaps even of syntactic structures and pragmatics, and the overall influence of relative fluency/proficiency in each language. Finally, some of the same issues regarding the time course in ambiguity resolution that are important in monolingual explorations can be examined in bilingual speakers. If there is an influence of the first-language meaning of an ambiguous word on processing that word in a second-language mode, does that influence vary as a function of the processing time for that word? These are just some of the avenues of research that naturally stem from the aforementioned results discussed earlier, and are directions for research that will likely be followed within future years.

Other areas for future research involve those surrounding the socio-pragmatic effects of code-switching. For instance, researchers have investigated the role of code-switching and language mixing in advertising. For example, Luna et al. (2005), as mentioned earlier investigated the effects of code-switching on the persuasiveness of messages presented to consumers. Maintaining grammatical structure and following syntactic rules tend to lead to more persuasive messages than intermixing languages in a less rule-structured format. Thus, code-switching and language mixing may be examined for what they can afford individuals in terms of enhancing communication among bilingual speakers. Discourse processing within social or pragmatic venues may be an important direction of investigation, as the role of language mixing is further explored within the realms of psycholinguistics and communication.

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CHAPTER 2

Language selection and performance optimisation in multilinguals

Renata F. I. Meuter
School of Psychology and Counselling, Queensland University of Technology, Brisbane, Australia

Speakers aim to optimise language performance. In multilinguals, such optimisation requires (1) preparedness to respond in any language as cued by context, thus facilitating language switching; (2) increased sensitivity and responsiveness to language cues, and (3) the ability to maintain a selected language. Multilinguals are well attuned to changes in linguistic context and the associated performance demands. Evidence for optimisation comes from trilingual speakers who experience reduced language switch costs when speaking three languages as opposed to speaking only two. In nonbalanced speakers, active suppression of another language appears to occur only in a multilingual context. Whether optimal language selection performance results from fundamental changes in the underlying cognitive processes or from their more efficient use, remains to be seen.

Keywords: language selection, language switching, performance optimisation, multilingual, bilingual

Language selection and performance optimisation in multilinguals

Being prepared to speak one or another language at will, as dictated by linguistic context or communicative intent, is a common experience for many multilinguals[1]. Two seemingly conflicting phenomena characterise their linguistic performance. First, they can keep their languages perfectly distinct, without any obvious interference. Second, they can use their languages interchangeably, often within the same sentence (e.g., Clyne, 1980, 1997; Clyne, 2003; Shridhar & Shridhar, 1980). Both patterns of language use indicate that language selection

1. 'Multilingual' is used here to encompass speakers of more than one language. Whenever studies focus explicitly on bilinguals or trilinguals, this will be highlighted.

generally is highly efficient and goal directed, with shifts of language in conversation revealing much about the intentional nature of multilingual communication and the speakers' responsiveness to social and linguistic contexts (e.g., Clyne, 2003; Myers-Scotton, 1999). Differences in the type of sentential switching observed suggest that relative proficiency affects code-switching patterns (Dewaele, 2001; Myers-Scotton, 2003). Thus more advanced (proficient) second language learners are better able to maintain separation between the languages, as evidenced by a reduction in cross-linguistic slips of the tongue (Poulisse, 2000). Shifts of language can also occur unintentionally (e.g., Clyne, 1980, 1997; Poulisse, 2000; Poulisse & Bongaerts, 1994; Shanon, 1991), possibly revealing a momentary lapse of control. Multilinguals then present an intriguing case, because the efficient use of language involves a degree of selective control at a level not required in monolingual speakers.

Language characteristics may be largely responsible for the level at which switches occur (cf. Clyne, 2003) but here I focus on the processes that facilitate or enable language selection generally, with an emphasis on single word production. Most accounts of language selection involve a mechanism to resolve the competition assumed to arise from the activation of response alternatives, especially those from the other language. For example, in the Inhibitory Control model (cf. Green, 1998) competing responses in the other language are actively suppressed by virtue of being identified, through associated language tags, as not corresponding to the intended language of communication. Poulisse and Bongaerts (1994) proposed that lexical selection occurs through spread of activation, with differences in activation thresholds (lower for the stronger language) accounting for difference in the ease with which the correct lemma, tagged for language, is accessed. Others similarly argue that changes in relative levels of activation account for relative ease of access (De Bot, 1992; De Bot & Schreuder, 1993; Grosjean, 1997, 2001; Paradis, 1981, 2004). Both Green and Grosjean reason that language production is facilitated by the relatively higher level of activation of the selected language (independent of language dominance) compared to the other possible languages. These other, competing languages are not entirely deactivated however and may still affect performance. In continuous speech, when more than one language is appropriate for response, typically one language is selected as the matrix language (cf. Myers-Scotton, 1999, 2003), with the other language(s) sufficiently activated to be incorporated into the output. This latter context (denoted the bilingual language mode; Grosjean, 2001) is often characterised by language switches involving borrowed items from the other languages (words or short phrases) and adapting these in some way to the matrix language (see also Muysken, 2000). Such switches can occur within and between sentences.

Intuitively it appears logical to assume that the dominant L1 will always be more highly and easily activated generally, and more difficult to suppress or deactivate. However, other accounts suggest that threshold fluctuations, driven by contextual demands, determine the relative availability of each language relative to the other and of subsets of items in a language relative to those in another (e.g., Costa & Caramazza, 1999; De Groot, 1998; Grosjean, 2001; La Heij, 2005; Roelofs, 1998). Such a view allows for greater dynamism in the system, where recent language experience can increase language accessibility globally (Meuter, 2001) but also at the level of single responses (Meuter & Shallice, 2001). Some even contend that lexical access is confined to one language only (e.g., Costa & Caramazza, 1999), bolstered by the observation that code-switching (CS) can be perfectly fluent. However, such fluent transitions may equally occur because all languages involved are sufficiently activated for other-language responses to become viable options (cf. Green, 1998). Alternatively, information as to the language of production contained in the preverbal message[2] may ensure that only one lexical item is uniquely specified as regards its conceptual and syntactic identity as well as its language-specific form (e.g., La Heij, 2005).

Here I assume that multilinguals, irrespective of the level of proficiency they have attained in their languages, aim to optimise their performance, be it in a monolingual or a code-switching context. This is not a novel assumption. Myers-Scotton (1999), for example, argues that speakers' linguistic behaviour is based on rational choice aimed at optimising the outcome of the social interaction, and strategies believed to arise from the need to optimise performance have been identified (e.g., Toribio, 2004). The focus in this chapter is on the cognitive processes that enable performance optimisation, i.e. the most efficient use of the language (or languages) selected for communication in a given context. High performance efficiency is ensured and manifests itself differently for multilinguals at varying levels of proficiency and in different linguistic contexts. I will explore the following questions. (1) What are the processing mechanisms that enable the optimisation of performance in one or more languages in a multilingual speaker? (2) To what extent do level of proficiency, age of acquisition (AoA: early vs. late)[3], contextual demands (e.g., the requirement to switch, the number of languages used), and typical language use (level of habitual language switching), determine the language

2. The preverbal message is the communicative intention of the speaker and it determines the structure of the message that is eventually articulated (cf. Levelt, 1989).

3. Individual differences that are related to AoA are notoriously difficult to pinpoint. Recent evidence regarding a critical period prior to which maximal brain plasticity favours language acquisition (Penfield & Roberts, 1959) suggests that different aspects of language vary with respect to the time at which they can still be acquired and the level of competency that can be attained (e.g., Birdsong & Molis, 2001).

processing mechanisms? I will discuss data from experimentally induced language switching performance demonstrating that language selection operates at the macro (global) and at the micro (local) level to optimise performance.

Language switch costs and optimisation

During regular communicative interactions interlocutors plan the content of their next utterance, including the language in which they intend to utter their next sentence. Thus an intentional switch of language can be fluent, and unaffected in its production by any features of the main language spoken (Grosjean & Miller, 1994). Nonetheless, however smooth a switch of language may seem to a listener, there will likely be a time cost associated with it. This cost has been observed in language production (Kolers, 1966a; Macnamara, Krauthammer, & Bolgar, 1968; MacNamara & Kushnir, 1971) and in comprehension (Dalrymple-Alford, 1985; Thomas & Allport, 2000). When determining the language switch cost in production, it is calculated as the difference in response times (RTs) associated with consecutive same language responses (e.g., from L1 to L1; *repeat trials*) and RTs associated with switches of response language (e.g., from L2 to L1; *switch trials*). Language switch costs occur in nonbalanced (variedly proficient) and balanced (highly proficient) bilinguals (Costa & Santesteban, 2004; Meuter & Allport, 1999).

Careful consideration of the language switch cost provides a window on the processes that facilitate bilingual linguistic performance. It is important to emphasise here that the term 'cost' in this context is not synonymous with 'inefficiency'. Costs are experienced in any change of task, and the differences in the costs (i.e., in the time taken to shift task (or language) compared to remaining on task) reveal the relative efficiency with which the shift is effected. Thus smaller costs on language shifts imply relatively greater efficiency; however, such efficiency could be brought about by dynamic changes in the accessibility of the languages to be spoken. Such changes could involve a slowing of responses more globally, an effect that might be more marked on repeat responses, especially in the dominant language. Alternatively, changes in accessibility may be such that a weaker language is more highly activated. Some evidence will be discussed that suggests such processes operate in the multilingual lexicon. By exploring performance differences between response languages in (1) the RT costs (in ms) as obtained by comparing repeat and switch trials, (2) RTs on identical trials in different contexts (e.g., repeat trials in monolingual vs. bilingual contexts), and (3) response errors, the processes that determine the efficiency with which a speaker manages the transitions between languages can be elucidated. Language transitions in continuous speech may reveal costs, or illustrate performance efficiency, in ways other than the time taken to effect a response. For example, speakers may converge between the languages at a grammatical level (Toribio, 2004). However, most experimental studies focus on single responses and not on continuous speech. Experimental tasks differ from natural language performance in that the amount of preplanning that can occur is strictly limited (e.g., De Bot, 1992; Poulisse, 1997), including the absence of advance knowledge of the specific lemma to be retrieved. It is only on the appearance of the critical stimulus that this decision can be made.

To perform a task (or speak one language) from an array of possible alternatives is to adopt a set of cognitive processes and operations (collectively referred to as a task-set) that enable the task to be performed (or the language to be spoken) without any foreknowledge of the identity of the critical stimulus to which a response is to be made. The formation of a task set implies a largely proactive component to task execution. Most of the insight into task switching has come from the monolingual domain where switches between tasks are typically confined to key press responses (e.g., Allport, Styles, & Hsieh, 1994; Rogers & Monsell, 1995; Meiran, 1996). Comparatively little research has focused on language switching, a form of task switching that multilinguals frequently and continuously engage in. In an experimental setting language switches are typically manipulated from trial to trial and the associated costs have been measured using key presses (e.g., Macnamara et al., 1968) but also verbal response latencies (e.g., Dalrymple-Alford, 1967; Kolers, 1966b; Meuter & Allport, 1999; see Meuter, 2005, for a review). The data typically consist of RTs and errors associated with individual responses on repeat and switch trials.

To accomplish language selection in natural contexts, control has to be exercised to enable formation of a language response set. The intention to speak L_A and not L_B can be exogenously determined (i.e., through the experience of spoken or written information or the appearance of a different interlocutor) but it also can be entirely endogenously driven (i.e., independent of external factors and internally motivated) (see also de Bot et al., this volume). As often as not, shifts between languages entail the maintenance of the newly adopted language set for a period of time. Interactions with monolingual speakers will require language maintenance, because intrusions from another language would be maladaptive and inefficient. Interactions in a bilingual context, by contrast, could entail frequent shifts of language. When producing an utterance in L3 and not L1 (or L2) the multilingual speaker can be said to have adopted a language set, i.e. the intention to respond in L3 (and not any of the other known languages). Thus switching between languages can be conceptualised as switching between language sets. The ability to do so may be simply another instance of our general cognitive ability to switch between and control task sets. Alternatively, the use of multiple language systems may trigger the development of a form of task control that is unique to multilingual speakers[4].

The optimisation of language performance carries a number of -at times contradictory- demands, and speakers may differ in the way in which they ensure optimal performance. Thus optimal performance for an L2 learner in an L2 classroom setting would require L1 interference to be curbed (for the most part), while for a bilingual speaker in a bilingual context it would entail guaranteeing smooth transitions between languages by ensuring similar accessibility levels. Accordingly, depending on socio-linguistic demands, performance optimisation for speakers of more than one language requires (1) a readiness to respond in any language, if both might be called on, thus facilitating the ability to switch between them, (2) a heightened sensitivity and responsiveness to language-related cues (such as an interlocutor's accent or pattern of language use), and (3) the ability to maintain a language, once selected, for as long as necessary. The extent to which a speaker can satisfy these demands is variably affected by relative proficiency and/or AoA. Optimal performance, in turn, will be variably determined by the processes that underlie the formation of language sets and any proactive effects language sets, once adopted, might have on performance.

Relative proficiency and optimisation

The importance of relative language proficiency in determining the efficiency with which a switch of language could be made was first recognised by Macnamara (1967) who assumed that the stronger, dominant L1 should be the easier language to speak and, therefore, also the easier language to switch to. Certainly in nonbalanced bilinguals a marked L1 advantage would be expected whenever L1 is used. The dominancy-driven intuition is only partly accurate: Meuter and Allport (1999) demonstrated that switching to the dominant L1 is measurably more (and not less) difficult than switching to the weaker L2 in nonbalanced bilinguals, while repeated same-language responses showed the expected pattern of language dominance. Moreover, response times when having to speak L1 on a switch of language were increased compared to instances where, on a switch of languages, L2 was spoken. L1 then is not always the more efficient language to use, a finding since confirmed by others (e.g., Costa & Santesteban, 2004; Philipp, Gade, & Koch, 2007).

A form of negative priming from the language set on the preceding trial can account for this apparent paradox (see also Allport et al., 1994). In this view the

4. Whether or not such control is domain-specific (i.e., restricted to language processing only) or facilitates task selection generally has been the subject of recent enquiries (Bialystok, Craik, Klein, & Viswanathan, 2004; Meuter & Simmond, 2007; Simmond, 2006).

observed cost results from language set inertia, top-down control biases that persist until the next trial. The argument goes as follows. Speaking the weaker L2 (for example) involves control processes that ensure the activation of L2 and powerful suppression of the alternative dominant L1 (commensurate with the proficiency or strength of L1; see also Cohen, Dunbar, & McClelland, 1990). Once established, the language set continues involuntary into the processing of the stimulus for the next trial. When on the next trial L1, and not L2, is required in response, this inertia results in a large switch cost. By contrast, generating responses in L1 requires a set that is not nearly as strongly imposed and a subsequent shift away from L1 to speak L2 does not carry as large a cost. Thus the major determinants of the language switch cost are thought to arise from the language just used rather than from the language to be switched to (see also Allport & Wylie, 2000; Wylie & Allport, 2000). CS observations are consistent with this interpretation, with hesitations often preceding a switch of language (e.g., Clyne, 1980; Clyne, 2003; Shridhar & Shridhar, 1980), and trigger words motivating a subsequent switch of languages (e.g., Broersma & de Bot, 2006; de Bot et al. and Broersma et al., this volume).

Meuter and Allport's (1999) findings are evidence of performance optimisation. L1 activation is decreased, thus making it more difficult to produce L1 responses (as revealed by longer latencies), while L2 activation is increased, thus facilitating L2 responses (as revealed by shorter latencies). Importantly, adjustments to language accessibility occurred also on repeat trials but relative language dominance was maintained. Consistent herewith is evidence that the suppression of a response in one language might entail the entire associated language set (e.g., Loasby, 1998; Meuter & Shallice, 2001). For example, data from nonbalanced Italian-English bilinguals suggests that RTs on repeat trials are affected by the immediate linguistic context (monolingual vs. bilingual; Meuter & Shallice, 2001). A Bilingual Vigilance task[5] required bilinguals to name random, single numerals rapidly in one or other language but suppress responses to relatively infrequent presentations of a target numeral (*p*(target) = 0.2). The to-be-suppressed target occurred on repeat and switch trials, and responses were therefore withheld on repeat trials (e.g., L1-*L1[suppress])* and on switches (e.g., L2-*L1[suppress]*). The language of response was cued by the colour rectangle within which each number appeared, and number and cue were presented simultaneously. Monolingual and bilingual contexts were created. Of primary interest were responses on trials that immediately followed a suppressed response. Whereas in other switch paradigms it is inferred from the RT costs that inhibitory processes played an important part, using active response suppression there could be little doubt that – on the successful withholding of a response – such inhibition had indeed occurred. In the bilingual context, RTs on re-

5. Adapted from Robertson, Manly, Andrade, Baddeley, and Yiend (1997).

peat trials in both languages were markedly slower than those in the monolingual context (i.e., blocked by language), indicating global changes in accessibility. More importantly, on suppression of a repeat response (e.g., L1-*L1[suppress]*) in the bilingual context, RTs associated with the subsequent repeat trial (e.g., L1-L1[suppress]-*L1*) reflected a cost as large as a regular switch cost (see Figure 1). No such cost occurred on identical trials in a monolingual context. This pattern of results suggests that, in the bilingual context only, the active suppression of a response results in the suppression of the associated language.

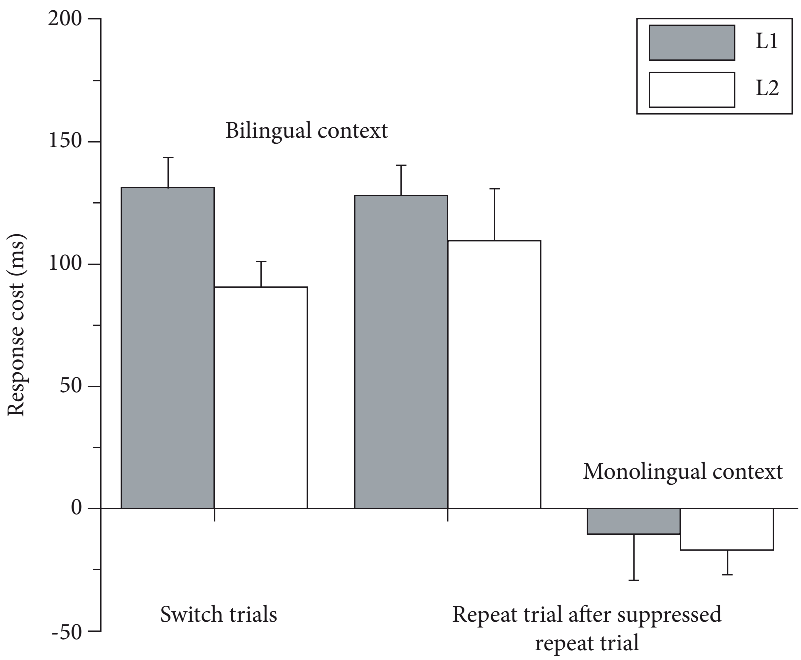

Figure 1. The subset of data shown here are adapted from Meuter and Shallice (2001). On an adaptation of a Bilingual Vigilance task, some trials required suppression of the response irrespective of the language cued. Suppressed responses occurred on repeat (e.g., L1-*L1[suppress]*) and switch trials (e.g., L2-*L1[suppress]*). Responses on trials that immediately followed a suppressed response also were either repeat trials (requiring the previously suppressed language to be used; e.g., L1[suppress]-*L1*) or switch trials (a switch from the language cued on the suppressed trial; e.g., L2[suppress]-*L1*). Response costs associated with switch trials for L1 and L2 are given (leftmost columns), as are the response costs associated with repeat trials following a suppressed response on a same language repeat trial (e.g., L1-L1[suppress]-*L1*) in a bilingual context (centre columns) and in a monolingual context (rightmost columns).

A number of models similarly assume that on the production of a response in L_A all alternative responses, particularly responses in L_B, are deactivated. For example, in the Inhibitory Control model, lemma alternatives whose language tags do not match the required response language are suppressed reactively, via language task schemas, to an extent commensurate with the strength of activation of the other language (Green, 1998). This idea does not exclude the possibility that differences in relative frequency of individual lexical items can affect the ease with which those items are accessed. Thus it is conceivable that, to ensure that a correct item is selected for production, close translation equivalents might need to be more strongly inhibited than non-associated items in the other language. At the same time, some items may well be mutually facilitatory across languages, as appears to be the case with cognates (e.g., Lemhöfer & Dijkstra, 2004). A dynamic system focused on optimal performance, be it in several languages or only one, would accommodate such apparently mutually exclusive processes. To date analyses have not incorporated this level of analysis, that is, an item-by-item analysis of the costs incurred on a switch of language with reference to the item's linguistic characteristics. (See Meuter, 2005, for a review.)

Consistent with the notion of relative proficiency, balanced bilingual speakers show equal switch costs in either direction (Meuter & Allport, 1999). There has been a suggestion that trilingual speakers, balanced in L1 and L2 but weaker in L3, show an unexpected symmetry when switching between L1 and L3 (Costa & Santesteban, 2004). However, any argument regarding purpose-formed control mechanisms (specifically for the regulation of language selection) to explain the finding are weakened by the lack of baseline language performance data and a confound between relative proficiency and AoA. Meuter and Milner (2007; Milner, 2005) attempted to evaluate the independent contributions of proficiency and AoA. They described language switch data obtained from English-Afrikaans-Zulu trilinguals for whom performance differences were related to language proficiency, not AoA. The trilinguals switched languages predictably when naming pictures of common objects. In any given bilingual condition they switched between only two of their languages. All three bilingual language contexts were used (i.e., L1L2, L2L3, and L1L3). Baseline response measures were obtained using monolingual contexts (i.e., naming blocked by language) prior to performing the switch tasks. Proficient trilinguals were classified as proficient with reference to subjective L1 and L2 proficiency ratings (> 4 on a 7-point scale). Language acquisition history was used to determine AoA, with early acquisition defined as L2 acquisition prior to age 7. While this data still incorporates a confound (the same speakers were classified according to the two measures), the marked difference in performance patterns was revealing. Interestingly, no switch cost differences were seen between highly and less proficient L1-L2 speakers when switching between L1 and the much weaker L3, suggesting that lack of asymmetrical effects may be a result not of specialised control processes that develop as a result of AoA or high proficiency but rather of modulatory effects that arise from controlling more than two languages.

Such a conclusion does not seem unreasonable. Optimal performance when response selection is more complex may well result from some adjustments in basic processes. It is conceivable that preparedness to execute tasks in a more demanding setting (a multilingual setting could be viewed in this light)[6] might engender greater efficiency because speakers heighten their attention, perhaps improving their attentional control overall and thus ensuring optimal task performance. The execution of complex, multitasks might yield faster individual RTs overall than the same tasks carried out singly (Washburn & Putney, 2001). In particular, an increase in difficulty of an initial (motoric) task (precision pointing of a cursor) was shown to result in faster RTs on a consequent cognitive task involving stimulus recognition following brief presentations. Admittedly these results were obtained in the context of a computer-based recognition task, however the argument can be made that the basic principle is one of the attention-demanding nature of a task, as determined by task difficulty. Task difficulty may improve performance by generally increasing arousal, resulting in more attentional resources becoming available (Kahneman, 1973) and hence a greater capacity for attentional control. If so, managing more languages may be (paradoxically) more efficient than speaking only two. I will return to this possibility and discuss some relevant data from trilingual speakers. The notion of increased attentional control also begs the question of how experience of habitual code-switching or mixing affects the ease of language selection. It is conceivable that such experience plays a powerful role, perhaps even overriding any effect of language proficiency. To date, however, the role of switch experience in modulating relative ease of switching remains to be investigated.

To recap, in a multilingual setting greater efficiency may be achieved by adjusting language accessibility through generalised inhibitory and excitatory processes that globally determine the likelihood that a language is selected for response. Thus performance optimisation might be primed by the context in which language switching occurs. The concept of language sets implies that micro effects (such as the processes involved in establishing a language set) operate against a background of global language-specific activation and inhibition levels. Given the inertia associated with established language sets (the switch cost effectively shows that the effect of a previous language set is not overcome until the next response is

6. The assumption that a multilingual setting is more demanding is monolingually biased. For example, a monolingual context imposes equally high – if not higher – demands on multilingual speakers accustomed to habitual code-switching.

determined), it is conceivable that prior responses in L_A, especially in sentence context, may have consequences beyond the immediately subsequent response and impact on L_B at a later stage in production. Accordingly, a requirement to shift response language may be affected by continued proactive effects of previously used language sets further back than the immediately preceding response.

Optimisation in context

A bilingual in a bilingual setting effectively operates in a dual-task setting and, even when only one language is used at a given time, the other language is always at a certain level of preparedness (e.g., Grainger & Dijkstra, 1992; Grosjean, 2001; Paradis, 2004). Yet, depending on the context, multilinguals will adopt a language setting which enables them to use either language with a certain ease (see Grosjean, 1997, 1998, 2001, for a discussion of language mode). Here language setting is defined more broadly than language mode to refer to the speaker's *preparedness* to use a language. Preparedness involves determining the likelihood that one or the other language is more or less likely to be used and adjusting the relative levels of activation accordingly, remaining vigilant for (socio)linguistic cues signalling language use, as well as selecting the control processes required to facilitate language use (single or multiple) under those specific circumstances. Such control processes could facilitate frequent language switches or, alternatively, enable the speaker to maintain a selected language. Within the framework of the Inhibitory Control model (Green, 1998), a language setting requiring frequent switches could be instituted by activating the appropriate task schemas equally (see also von Studnitz & Green, 2002) and adjusting relative levels of activation across the languages in question. Other models could accommodate the switch phenomenon similarly, through adjustments in baseline activation levels (e.g., de Bot & Schreuder, 1993; Grosjean, 2001; Paradis, 2004). Monolingual performance, on the other hand, would be accomplished through the suppression of competing, other language responses. As suggested earlier, the question remains whether such varied demands placed on a speaker may, eventually, result in more profound changes in the cognitive processes that drive performance.

At the same time, the efficiency with which speakers select and use a language (or more than one) is in part affected also by the language used or processed immediately prior. For example, a bilingual speaker in bilingual Montréal lives with a high level of unpredictability with respect to which language to use. This unpredictability, even if associated with a roughly equal likelihood of language selection, is bound to affect the ease of language selection. Similar levels of activation for each language would be optimal, so that language selection may proceed with as little delay as possible. Depending on relative proficiency, one or other language may have to be more (or less) activated (or inhibited) to enable equal accessibility. However, it can reasonably be assumed that selection efficiency is affected also by the language used immediately prior. Thus greater language switch costs may occur when the degree of uncertainty is momentarily biased towards one or the other language. Lee and Williams (2001) demonstrated experimentally that such bias indeed occurs. They showed that if two L_B response trials were separated by a stimulus to be responded to in L_A, this effectively eliminated the priming effect that occurred when the intervening response instead was also consistently in L_B. That is, the irrelevant stimulus successfully biased responses towards L_A (by inhibiting L_B). Similar effects may occur in continuous CS speech.

Consistent with Lee and William's (2001) observation, recall that Meuter and Shallice (2001) showed that when bilingual speakers were asked to suppress responses to a particular stimulus irrespective of the language of response that was cued, if the suppressed response happened to be a repeat trial, it was only in the bilingual context that the suppression of the response was marked. In a monolingual context, by contrast, a suppressed response on a repeat trial resulted in only minimal suppression of the associated language (see also Meuter, 2005). Thus only in the bilingual context, when either language could be appropriate in response, does the suppression of a response in L_A result in the suppression of L_A as a whole (see Figure 1, centre columns). This is why a further response in L_A now incurs a cost. These effects were obtained within the same experiment, suggesting that response readiness can be altered fairly immediately. Furthermore, linguistic context fundamentally affects the speakers' preparedness to use language. The differences in the implementation of inhibitory control may well be effected via task schemas (cf. Green, 1998). Only in a bilingual context is the suppression of a response in L_A interpreted as a cue to activate the task schema associated with speaking L_B which, in turn, may trigger partial configuration of the language set needed to respond in L_B. Similar effects were obtained by Loasby (1998) with fluent bilinguals who named pictures that were selectively more or less practiced in L1 or L2. Importantly, the study used subsets of pictures within each language that were either practiced or received no practice at all. When switching from naming a picture in the less practiced language (where the response required powerful inhibition of the competing response), the switch cost experienced was more than four times larger than when the preceding response had involved a response in the practiced language. Again, these results reflect the suppression of a whole language when a competing response is inhibited.

Given the sensitivity to contextual demands it is likely that the production of a response, especially if embedded in a meaningful utterance, will be affected also by the nature of prior responses further back in the response chain. Long lasting effects of earlier responses would play an important role in CS. The task switching literature has provided some convincing evidence that can be explored further in relation to language switching. For instance, Wylie and Allport (2000) discovered (using Stroop colour/word and neutral stimuli) that experience with alternative stimulus-response (S-R) mappings as far back as 100 trials or more reliably increased switch costs and, as a consequence, amended the task set inertia hypothesis to reflect these long-term associative effects. Experience with another task and, therefore, alternate S-R mappings, increased the RTs on switch and repeat trials. For multilingual speakers, responses in any known language are potential candidates for response and any given concept can be expressed in multiple languages. Other-language responses to the same stimulus (effectively alternative S-R mappings) may affect subsequent response selection relatively more by virtue of having been retrieved in the recent past.

The extent to which other-language response alternatives affect response efficiency is determined, at least in part, by the extent to which the speaker is prepared to speak one language exclusively and/or has had occasion to use another language. Consistent with this notion recent use, rather than reported proficiency, affected switch efficiency when bilinguals were asked to recount significant events in one or the other (cued) language (Meuter, 2001). Strikingly, recent monolingual experience in a weaker L2 affected relative activation levels such that language dominance was reversed (i.e., L2 was more accessible) for some considerable length of time (a macro level effect). Thus, even if it is only in a bilingual (or multilingual) context that choosing to speak L_A implies the inhibition of L_B, a shift to a monolingual L_B context also is affected by extensive L_A use prior to switch of language context. Thus, for a multilingual speaker, efficient monolingual performance has far reaching effects on the accessibility of the other languages in the speaker's arsenal.

Using paradigms involving more than two tasks and considering across-trial effects, a number of studies have demonstrated that task switching performance is determined by persistent effects of task-set inhibition. For example, Mayr and Keele (2000) (see also Arbuthnott & Frank, 2000) compared costs associated with switching back to a task only recently suppressed (AB*A*: the prototypical switch paradigm) with those associated with a switch to a task used some time before (CB*A*, where Task A was used further back). A comparative increase in response cost on AB*A* relative to the intuitively more demanding CB*A* trials suggested that task set suppression persists across trials and is not resolved once a new task-set has been formed and a response made.

Similar persistent effects were seen in nonbalanced trilinguals when directly comparing switch costs associated with responses on Bilingual Alternating (e.g., L1-L2-L1) and Trilingual (e.g., L3-L2-L1) switching sequences (Binder, 2003; Meuter & Binder, 2004). Trilingual speakers named single, colour-cued numerals in a range of contexts. In the Monolingual context, numerals were named in one language only (separately for each language), thus yielding baseline measures for each language. In the Bilingual contexts (L1L2, L1L3, and L2L3) switches of language occurred every two trials, alternating with repeat trials. The switch trials in the bilingual contexts were the type of switch trials typically measured in language switching and are therefore referred to as Bilingual Basic switches (e.g., L2-L2-L1), to distinguish them from language switches that occurred on every trial (Bilingual Alternating switches). Bilingual Alternating switches were incorporated in the Trilingual Context, which consisted of 5-trial sequences using all three languages. Figure 2 shows the typical structure of a trilingual sequence, which incorporates all possible switch permutations as well as a repeat trial. As can be seen in Figure 3, a comparison of switch costs in the Trilingual context showed that switching back to a language recently suppressed (e.g., L1 when effecting a switch to L2; L1-L2-*L1*; Bilingual Alternating switch) was significantly slower than switching once only

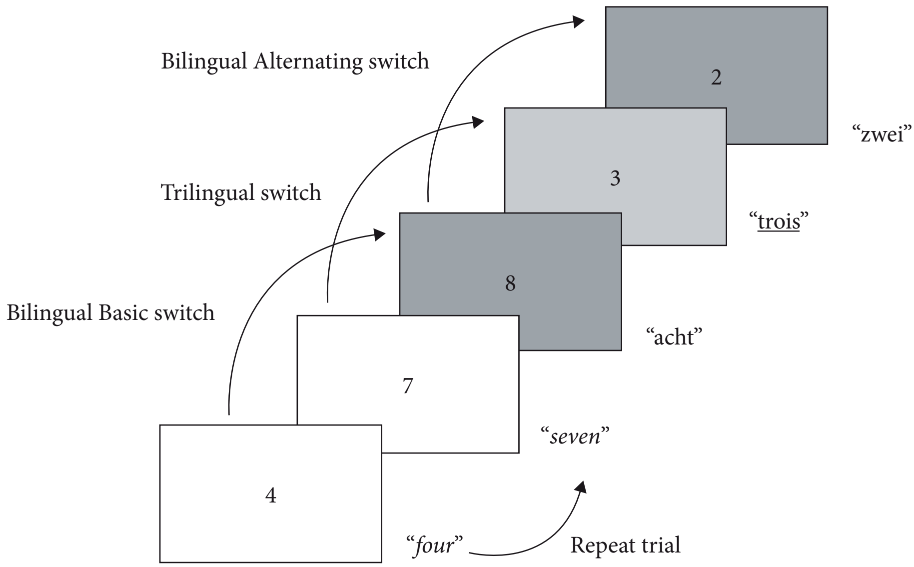

Figure 2. Each trilingual sequence started with two consecutive same language responses (repeat trial), followed by three consecutive switches of language. The first switch was always a Bilingual Basic switch (e.g., L1-L1-*L2*), the second a Trilingual switch involving all languages (e.g., L1-L2-*L3*), and the third a Bilingual Alternating switch (e.g., L2-L3-*L2*). Repeat trials and Bilingual Alternating switches formed the basis of the Bilingual Context (using an alternating runs paradigm; Rogers & Monsell, 1995). Repeat trials were compared across Monolingual, Bilingual, and Trilingual contexts, and Bilingual Basic switches across Bilingual and Trilingual contexts. Within the Trilingual context, all switch costs across switch types were compared (adapted from Binder, 2003; Meuter & Binder, 2004).

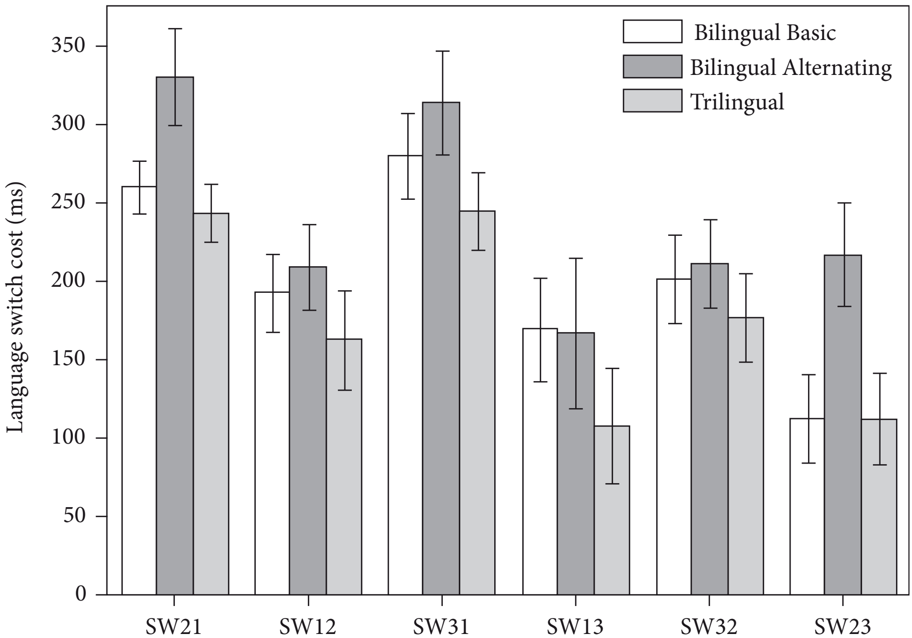

Figure 3. Language switch costs calculated within the trilingual sequences only, for Bilingual Basic switches (e.g., L2-L2-*L1*), Bilingual Alternating switches (e.g., L1-L2-*L1*), and Trilingual switches (e.g., L3-L2-*L1*). All switches are labelled according to the last two responses in a sequence of three consecutive trials. Accordingly, SW21 represent a switch from L2 to L1. (Adapted from Binder, 2003; Meuter & Binder, 2004.)

(e.g., L2-L2-*L1*; Bilingual Basic switch). More importantly, switching alternately between two languages only (e.g., L1-L2-L1) carried a greater cost than switching between three languages (e.g., L2-L3-L1). Thus not only was the language no longer required (and switched away from) actively suppressed but, critically, this suppression persisted *beyond* the first response in another language. Hence the multilingual language system, in nonbalanced speakers at least, is predisposed towards maintaining a language of response once selected and does this by ensuring that the language just spoken remains - for some time - less accessible.

Contextual demands could be such that the default setting for the stronger L1 is one of continual (relative) inhibition and for the weaker L2 one of continual activation, ensuring that both languages are equally available for use and contributing to the long-lasting effects observed. A nonbalanced English-French speaker working and living in a bilingual environment may ensure performance efficiency in this way. The same speaker in a Francophone environment, to ensure flawless performance in the weaker L2 (French) and avoid interference from the stronger

L1 (English), aims to consistently suppress L1 (and activate L2 relatively more strongly). Our trilingual data showed effects not only of recent language use but also of language setting on performance efficiency. Repeat responses followed the expected language dominance pattern in each monolingual language context, with L1 responses significantly faster than both L2 and L3 responses, and L2 responses in turn faster than L3 responses. However, while latencies on repeat trials were significantly longer in language switching contexts (reflecting adjustments to relative language accessibility), they were not measurably different across the bilingual and trilingual contexts. For the nonbalanced trilinguals tested here it seems that, once a language has been selected, it is irrelevant whether the language context involved a choice between two or three languages. Interestingly, however, Bilingual Basic switch RTs (e.g., L1-L1-*L2*) overall were significantly increased in the trilingual compared to the bilingual context, as were the associated switch costs (see Figure 4).

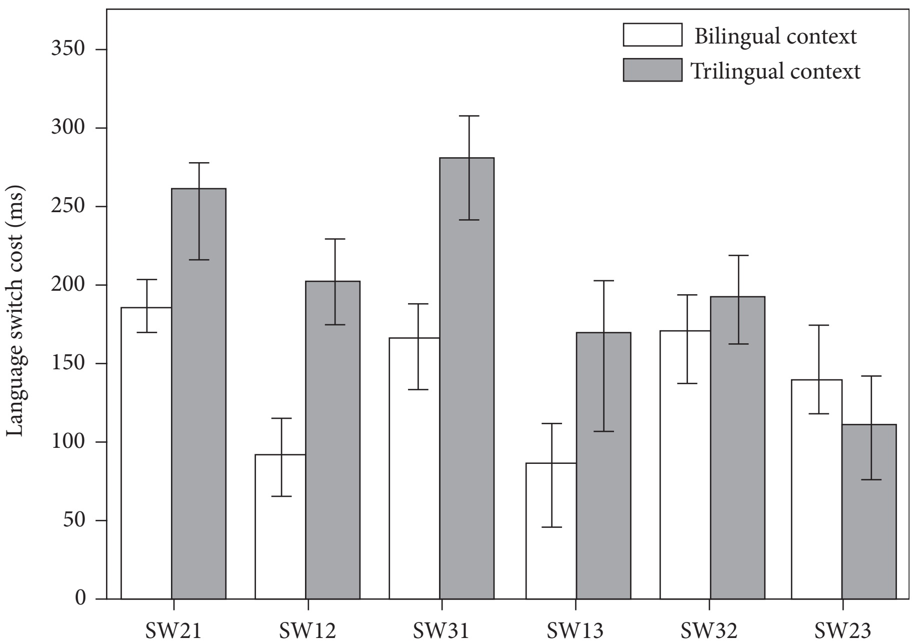

Figure 4. Language switch costs for Bilingual Basic switches only, across bilingual and trilingual contexts (adapted from Binder, 2003; Meuter & Binder, 2004). All Bilingual Basic switches are labelled according to the last two responses in a sequence of three consecutive trials. For example, the first two columns, labelled SW21, represent the costs associated with the Bilingual Basic switch from L2 to L1 (L2-L2-*L1*) in the bilingual and trilingual contexts, respectively.

Thus a language context that requires a preparedness to use more than two languages at any given time has seemingly contradictory effects. First, the need to respond efficiently results in virtually equal decreases in accessibility for all languages involved in the selection process but such that the relative activation of the languages is maintained. Of note here is that, at least in nonbalanced bilinguals, this threshold adjustment is independent of the number of languages involved. Second, a switch of language carries a greater cost in the trilingual context. This increase appears to be due to increased RTs on switch trials only rather than the overall slowing of responses.

Arguably, the increased overall costs seen in these nonbalanced trilinguals could be due also to a relative inexperience with switching between multiple languages. Speakers who regularly code-switch may develop more efficient means by which interference is minimised and performance optimised. We have yet to determine how habitual switch experience affects the processes that enable switching. It may then be important to distinguish also between the types of CS the speakers engage in and the frequency with which they use various constructs.

Contrary to an earlier suggestion that increased task difficulty might improve performance, no consistent benefit appears to exist when controlling three languages, at least not on this particular experimental task. However, the increase in the number of languages used did not result in reduced efficiency overall and, in fact, repeat trials were equally fast in both the bilingual and trilingual contexts. Furthermore, the trilingual switches were notably faster than the bilingual switches. There are indications therefore that there are dynamic effects that, at the very least, maintain performance in the face of increased complexity and potentially reduce costs. The pattern of performance maintenance on repeat trials and variations switch costs (as related to the particular response sequence) may reflect processes similar to those that occur in spontaneous and contextualised speech, where the ability to pre-plan utterances would reduce switch costs and facilitate performance in more demanding settings. In the trilingual naming task described here, the colour cue that signalled the response language was always presented concurrently with the number to be named. Providing a pre-cue might go some way towards a clearer understanding of the dynamics underlying the planning of responses in as far as readiness to use a specific response language.

There is some evidence from nonbalanced speakers that lends support to the possibility of adjusting task readiness. Recall that on a switching task, when bilinguals were asked to withhold responses to a target irrespective of the language cued (the Bilingual Vigilance task), they optimised their performance by strategically adapting the default setting such that greater (continual) suppression was applied to L1 (Meuter, 2005; Meuter & Shallice, 2001). They also made significantly more Wrong Language errors (i.e., responses in L_A when L_B was cued for response) when L1 was cued for response, consistent with a global suppression of L1 aimed at facilitating overall performance. In a further experiment, providing longer pre-cues (as long as 1000 ms) reduced switch costs, and significantly more so for the weaker L2.

The data discussed here indicate that there are immediate effects of the contextual demands placed on a multilingual speaker. These effects operate not only globally, affecting the relative accessibility of the languages used in the context, but also locally, across individual responses. The trilingual data provide compelling evidence for the non-selective nature of language selection, revealing instead a highly dynamic and interactive system. The pattern that emerges is one of continual opposing demands on the cognitive system, aimed at optimising performance (Goschke, 2000; Gruber & Goschke, 2004). On the one hand, it is critical for efficient performance (where efficiency here includes both speed and performance quality) that all relevant task goals are maintained in a state of readiness, thus promoting greater flexibility in switching between tasks. On the other hand, to ensure error-free performance (and errors are virtually guaranteed by activating multiple tasks simultaneously) and to constrain the system to perform but one of the possible tasks, one task needs to be more highly activated and the other possible task selections to be suppressed. Thus the level at which languages are activated (or selected or dormant; cf. Green, 1986, 1998) is susceptible to dynamic changes, changes affected by recent usage. Previous experience can affect current performance because (1) alternate S-R mappings are involuntarily retrieved and enter into response competition, and (2) the de-selection (and selection) of a language is long lasting, beyond the first response in another language[7].

Future explorations

The multilingual speaker then is continually engaged in resolving conflicting objectives in the bid for optimal performance. I have reviewed findings that show globally implemented changes in language accessibility, and effects of language selection that impact more locally but radiate beyond a shift of language. While much of the data addressing these issues is based on studies with fairly restricted stimuli (for a notable exception, see Taube-Schiff & Segalowitz, 2005), the behaviour that we are trying to understand concerns highly adaptive actions to optimise continuous performance while speaking more than one language.

7. The long-lasting effect of a language set does not sit easily with a task set reconfiguration account (Rogers & Monsell, 1995) that assumes reconfiguration is complete on the first trial of the new task.

Patterns of performance observed when switching response languages in experimental studies, even when only measuring individual responses, nonetheless have important implications for code switching in continuous speech by virtue of the adaptive processes they reveal. For instance, in the Bilingual Vigilance task just described (Meuter & Shallice, 2001), optimal performance involved more than merely providing quick and accurate responses. Every so often it required the withholding of a response. This is not dissimilar to a bilingual having to speak another language than the context led her to believe. Thus efficient performance, while determined primarily by the multilingual's overall proficiency in a language and the degree to which responses in the language have taken on automatic qualities, reflects more than mere speed of response. Instead efficiency can be viewed as the outcome of a possible change in the underlying processes (or their use) that results in faster performance rather than being defined only in the narrow sense of speed of processing.

A number of issues need to be explored to gain a more complete understanding of the processes that underlie multilingual language selection (as a function of either endogenous factors or exogenous demands) and that may facilitate (or hinder) the selection process. These issues are specifically related to possible changes in the cognitive processing underlying language switching. For example, (1) there may be performance differences between habitual code switchers and infrequent code switchers related to differences in the processes implemented as part of their preparedness to switch. Gathering the relevant data using language background questionnaires will allow this factor to be included in the analysis of data patterns (see for example Meuter, 2001). If habitual code-switching gives rise to different or more sophisticated processes underlying the formation of language sets (for example), one might expect habitual code switchers, even if not equally proficient in their languages, to show more symmetrical (and possibly reduced) switch costs. Efficiency here would not equate with relative strength of (and speed of processing in) each language but rather with processes affecting accessibility. Also, even if the patterns of language switch costs were the same in habitual code-switchers compared to their non code-switching multilingual counterparts, it may be possible to demonstrate differences in variability reflecting differences in the processes producing the response patterns. The mere fact that responses are provided equally quickly does not imply that they are produced in the same way. Incorporating task-independent measures of processing efficiency, such as the coefficient of variability (cf. Segalowitz, Poulsen, & Segalowitz, 1999), might be one way to determine whether differences in performance reflect fundamental differences in the underlying processes. Using such a measure would enable us to consider differences in processing that relate more specifically to the switching aspect, having accounted for differences due simply to ease of semantic access.

Related to the idea of the development of processes aimed at optimal performance efficiency, (2) do the mechanisms and processes that allow the selection of another language differ in those individuals who have been switching between their languages from childhood (early acquisition) versus those who have been doing so more recently (late acquisition)? That is, is the defining factor the age at which the languages were acquired (AoA) or the manner in which the languages are used or, alternatively, does proficiency override both of those factors? The answer to this question requires careful study of groups of speakers with varied AoA histories and different levels of proficiency. Findings by Mechelli et al. (2004) suggest that physiological changes in grey matter density occur as a function of proficiency on the one hand and AoA on the other but, as intriguing as those observations are, confounds in the data do not allow these two factors to be disentangled. Findings reported in the code-switching literature point at changes in the patterns observed with an increase in L2 proficiency (Dewaele, 2001; Myers-Scotton, 2003; Poulisse, 2000). If the determining factor is AoA then, following Meuter and Allport (1999), even highly proficient speakers would be expected to show asymmetries when switching from a third, weaker language to a stronger language if they acquired their L2 later in life. If early acquisition results in different underlying processes, not necessarily involving inhibition, then, following Costa and Santesteban (2004), even less proficient speakers would be expected not to show asymmetries when switching from a weaker L3, as long as they acquired their L2 early in life. As previously discussed, some recent data suggest that proficiency might override AoA effects (Meuter & Milner, 2007; Milner, 2005) but the issue needs further investigation. Including independent measures of performance efficiency might allow us to disentangle the – often confounded – effects of AoA and proficiency.

We know relatively little about the control processes when more than two languages are involved and the data described here strongly suggests that trilingual switching in production is facilitated compared to bilingual switching (Binder, 2003; Meuter & Binder, 2004), at least in a trilingual context, indicative of inhibitory processes that operate across languages to facilitate performance. Also, there is evidence that trilingual cognates are responded to faster than bilingual cognates (Lemhöfer & Dijkstra, 2004). Such findings are indicative of processes aimed at increasing performance efficiency. Could the existence of such forms of cross-linguistic overlap stimulate the development of more parsimonious processes to deal with the increase in choice? The critical contrast here is between highly proficient and less proficient L1 and L2 speakers, equally competent in a third language (trilingual speakers), and a third, exclusively bilingual group (i.e., without any L3 knowledge). Importantly, equal baselines should be established across groups for the dominant L1 and the weakest L3 on repeat trials, with a reliable difference in L2 proficiency between the trilingual groups. Any effect of trilinguality should be reflected in performance differences between the trilingual and bilingual speakers. Of importance here are comparisons across multilingual speakers of typologically diverse languages for which levels of cross-linguistic overlap vary.

Related to the issue of cross-linguistic overlap, (3) what is the role of language-specific information contained in the stimuli in facilitating (or hindering) the selection process? Data from the monolingual literature indicates reductions in the switch cost with unambiguous cues (Spector & Biederman, 1976). In nonbalanced bilinguals the provision of extended (language neutral) colour cues selectively facilitated L2 performance only (Meuter & Shallice, 2001). Data from Malay-English and Mandarin-English bilinguals carrying out a bilingual numeral naming task showed a marked benefit from language-specific cues for responses in both languages in Mandarin-English bilinguals for whom the numbers appeared in different scripts (Meuter & Tan, 2003; Tan, 2002). No such script differences existed for the Malay-English bilinguals. This pattern of results, while demonstrating the utility and use of cues to facilitate language selection, does not necessarily provide evidence for linguistic experience per se directly affecting language selection processes. Linguistic background does affect the ease with which an artificial logographic script is acquired (Ehrich & Meuter, in press), suggesting that experience with languages that – through their different typologies – focus attention on levels of linguistic diversity may well give rise to different or more efficient processes to manage language selection.

To reiterate, the multilingual speaker is on a continual quest to optimise language performance and increase efficiency. To this end it is essential that (1) the relevant languages are activated at levels that enable easy selection, (2) sensitivity to environmental cues is heightened and attention focused on language-relevant information and, (3) language choice is maintained once a language has been selected, for as long as required. The facilitation of frequent language switches may be appropriate in one setting, while language maintenance is more prudent in another. The need to negotiate the language environment and ensure optimal performance encourages multilingual speakers to be vigilant at all times. The extent to which linguistic demands motivate fundamental changes in the processes that underlie performance efficiency remain open to further investigation.

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CHAPTER 3

The neurocognition of switching between languages

A review of electrophysiological studies

Janet G. van Hell and Marijt J. Witteman*
Radboud University Nijmegen, the Netherlands,
the Pennsylvania State University, USA

The seemingly effortless switching between languages and the merging of two languages into a coherent utterance is a hallmark of bilingual language processing, and reveals the flexibility of human speech and skilled cognitive control. That skill appears to be available not only to speakers when they produce language-switched utterances, but also to listeners and readers when presented with mixed language information. In this chapter, we review electrophysiological studies in which Event-Related Potentials (ERPs) are derived from recordings of brain activity to examine the neurocognitive aspects of comprehending and producing mixed language. Topics we discuss include the time course of brain activity associated with language switching between single stimuli and language switching of words embedded in a meaningful sentence context. The majority of ERP studies report that switching between languages incurs neurocognitive costs, but –more interestingly- ERP patterns differ as a function of L2 proficiency and the amount of daily experience with language switching, the direction of switching (switching into L2 is typically associated with higher switching costs than switching into L1), the type of language switching task, and the

* Janet G. van Hell, Behavioural Science Institute, Radboud University Nijmegen, the Netherlands and Department of Psychology, The Pennsylvania State University, USA; Marijt J. Witteman, Behavioural Science Institute, Radboud University Nijmegen, the Netherlands.

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predictability of the language switch. Finally, we outline some future directions for this relatively new approach to the study of language switching.

Keywords: code switching, neuro-imaging, neurocognition, psycholinguistics, language proficiency

Introduction

When bilinguals talk amongst one another they frequently use two languages within the same utterance. Listeners who overhear a conversation in which bilinguals switch between languages are often impressed by this seemingly effortless switching of languages. The merging of two languages into a coherent utterance not only reveals the flexibility of human speech, but also demonstrates highly skilled cognitive control. Importantly, such skills appear to be available not only to speakers when they produce language-switched utterances but also to listeners and readers when presented with mixed language information.

Recent behavioral experimental studies on the cognitive mechanisms of language switching provide more insight into the co-activation and interaction across the bilinguals' two languages, the processing costs associated with switching between languages, and how bilinguals resolve competition between different cognitive systems (for reviews, see e.g., Meuter 2005; Meuter this volume). In the past decade, researchers have also begun to study language switching from a neurocognitive perspective. Multiple approaches are used but in this chapter, our main focus is on studies that examined language switching using one particular neurocognitive method, namely the recording of Event-Related Potentials (ERPs; for recent reviews of studies of language switching using neuroimaging methods, e.g., functional magnetic resonance imaging (fMRI) or positron emission tomography (PET), see Abutalebi & Green 2007; 2008; for a critical review on neuroimaging techniques in research on bilingualism, see de Bot 2008). As we will discuss, an important advantage of the ERP technique is its high temporal resolution that enables a study of task-related neural activity at millisecond precision.

Like the behavioral experimental studies, these ERP studies examine language switching in bilinguals who perform language switching tasks in an experimental situation. The focus in this chapter therefore is on controlled, task-induced language switches in production or comprehension tasks in a bilingual experimental setting, and not on spontaneous language switches as they occur in natural discourse situations (See, e.g., Jake & Myers-Scotton, this volume, for analyses of code-switches in natural discourse, and Kootstra, van Hell, & Dijkstra, this volume, for a novel approach to study language switches during discourse in a controlled laboratory setting.) We do think it is important that experimental (behavioral and ERP) studies try to model language switching as it occurs in natural situations, a point we return to at the end of our chapter.

Throughout this chapter, we use the term *language switching* to denote any switching between languages, in comprehension and in production. For the purposes of our discussion, language switching thus encompasses the switching of languages between single, unconnected items (e.g., words, numbers) as well as the switching of languages between words or phrases embedded in a meaningful sentence or discourse context. The latter type of switching is often referred to as code-switching (see Introductory chapter, this volume).

We review ERP studies that examined the production and perception of the switching of languages within a series of single items (pictures, numbers, or words) and of words embedded in a meaningful sentence. We specifically focus on studies that examined language switching in bilinguals. See van Hell and Tokowicz (in press) for a review of studies that examined bilinguals' sentence processing in L1 or in L2. Questions we seek to address include the following: What do ERP studies tell us about the time course of brain activity associated with switching between languages? Does switching between languages incur neurocognitive costs comparable to behavioral switching costs? What are the neural correlates of cognitive control and inhibition involved in language switching? Before reviewing the empirical studies on language switching, we discuss the basics of the ERP technique in language research and its application to furthering our understanding of language switching.

Basic principles and applications of ERPs in language research

Electrodes placed in key positions on the scalp can measure variations in electrical activity produced by large populations of brain cells. The recording of voltage variations over time is called the Electroencephalogram (EEG). ERPs are derived from the large amplitude EEG through a filtering process, and reflect regularities in electrical brain activity that are time-locked to an external event (see, e.g., Fabiani, Gratton, & Coles 2000; Handy 2005; Kutas, Federmeier, Couson, King, & Muente 2000; Luck 2005, for excellent introductions to ERP recordings and analyses). For example, when a stimulus word is presented to a reader on a computer screen, there are small voltage changes in the EEG that are time-locked to the onset of the presentation of that word. These voltage changes make up the ERP signal and reflect brain activity that is related to the presentation and processing of that particular word. ERPs thus provide an on-line, millisecond-by-millisecond record of the brain's electrical activity during mental processing. ERPs therefore can be used to index ongoing language-related perceptual and cognitive processes as they unfold over time.

An ERP signal consists of a series of positive and negative peaks (known as *components*) related to stimulus processing. Exogenous components occur early in the ERP signal (within 100 ms of stimulus onset) and are evoked by the physical properties of the stimulus (e.g., its color or brightness). In contrast, endogenous components reflect cognitive aspects of processing and are therefore most relevant for studies on neural activation associated with language processing. Endogenous components occur later in the ERP signal (at least 100 ms post stimulus onset).

ERP components are characterized by polarity, latency, amplitude, topographic scalp distribution, and a functional description of the cognitive processes they are assumed to index. An ERP component has either a positive polarity (positive-going wave, labeled by P), or a negative polarity (negative-going wave, labeled by N). Latency reflects the time course of the ERP signal and comprises onset latency (the time at which a component begins), rise time (the time it takes to go from a low value to a high value), peak latency (the time at which a component reaches its peak amplitude), and duration (the length of the component). Components are often labeled according to their polarity and peak amplitude latency (e.g., N400 is a negative-going wave with a peak amplitude occurring around 400 ms post-stimulus onset). A component's relative peak amplitude is assumed to reflect the degree of engagement of the associated cognitive processes. For example, the amplitude of the N400 decreases as the semantic relation between a word and the sentence in which it is embedded increases (e.g., Kutas & Federmeier 2000). ERP components further have a characteristic topographical scalp distribution. Although scalp distribution alone does not indicate the location of the neural generator in the brain, comparing distributional information across experimental conditions and across studies can provide important insights. Moreover, two components that are similar in polarity and latency but that differ in terms of scalp distribution (e.g., the N400 and Left Anterior Negativity, LAN) are assumed to reflect different cognitive processes. Accordingly, ERP components are described also in terms of the cognitive processes they are assumed to reflect and the experimental manipulation to which they are assumed to be sensitive.

The main ERP components that are reported in the ERP studies on language switching are the N2 and the N400 components, and the Late Positivity Complex (LPC; also known as P600). As its name suggests, the N2 is a negative-going potential. It develops around 200 ms after stimulus onset, and is distributed mainly over fronto-central electrode sites. The fronto-central N2 is elicited on tasks in which a response needs to be withheld and tasks that require response and strategic monitoring (for a recent review, see Folstein & Van Petten 2008), and is therefore believe to index cognitive control. The N2 also is usually enhanced in trials containing conflicting information and requiring an unexpected response. Gajewski, Stoerig, and Falkenstein (2008) suggest that the N2 is related to response selection, i.e., the cognitive process of assigning a specific response to a specific response category. The selection process is intensified and prolonged in conflict-trials that demand revision of the prepared response plan. Based on neuroimaging studies that indicate that the anterior cingulate cortex (ACC) is involved in response conflict monitoring (see for a review, Botvinick, Cohen, & Carter 2004) and in response selection (e.g., Roelofs, van Turennout, & Coles 2006; Turken & Swick 1999), it is probable that the fronto-central N2 originates from the ACC.

The aforementioned N400 is a large-amplitude negative-going wave in the 300–500 ms latency range. It reaches its peak amplitude around 400 ms after stimulus onset, and is usually largest over central and parietal electrode sites. The N400 indexes the integration of meaning and world knowledge (e.g., Hagoort, Hald, Bastiaansen, & Petersson 2004; Kutas & Federmeier 2000; Kutas & Hillyard 1980). It is enhanced, for example, when there is a semantic incongruency (e.g., Kutas & Hillyard 1980) or when words are difficult to integrate into a given linguistic context (e.g., Van Petten, Coulson, Rubin, Plante, & Parks 1999).

The LPC (or P600) is a positive-going wave that appears slightly after the N400 time window and extends for several hundred milliseconds. It typically has a broad posterior scalp distribution and, like the N400, is largest over centro-parietal scalp regions. The LPC is believed to reflect sentence-level integration (e.g., Kaan, Harris, Gibson, & Holcomb 2000) or re-analysis (e.g., Friederici 1995), sentence-level restructuring related to executive control (Kolk & Chwilla 2007), and memory retrieval processes (e.g., Paller & Kutas 1992). Late positivities are also associated with the processing of an unexpected or improbable task-relevant event (e.g., Coulson, King, & Kutas 1998; McCallum, Farmer, & Pocock 1984), or with a reconfiguration of stimulus-response mapping (e.g., Moreno, Rodriquez-Fornells, & Laine 2008). The LPC thus appears to reflect more explicit sentence-level wrap-up or meaning revision processes that, in the case of language switching, could be interpreted as the integration or active preparation of a language switch.

This brief overview of the ERP components believed to reflect cognitive processes central to language processing begs the question of what the ERP technique can contribute to the study of language switching. Corpus studies of code-switched utterances provide valuable information on the structural aspects of switching between languages and factors in the sociolinguistic context that potentially affect code-switching (see, e.g., Backus, this volume). Cognitive, behavioral studies on language switching provide important information on the cognitive processes associated with language switching (see, e.g., Marian, this volume; Meuter, this volume). However, by the very nature of the measures that are used, behavioral studies typically measure the end-state of the process, e.g., the moment a language-switched word can be named. Because ERPs provide an on-line, millisecond-by-millisecond record of the brain's activity during cognitive processing, they provide valuable information on the timing and degree of neural activation as language processing unfolds in real time. ERPs therefore are particularly helpful in providing insight into the temporal dynamics of sub-processes associated with language switching, processes that drive and determine the behavioral response but occur before it is realized. Additionally, ERPs can provide further insight into the nature of the cognitive costs typically experienced when switching between languages.

Review of ERP studies of language switching

This review of studies using ERPs to examine bilinguals' switching between languages is divided into two parts. In the first part, we discuss studies that focus on the switching of languages when reading or naming a series of unconnected single items (e.g., pictures, numbers, or words). Of the studies that examined language switching from a cognitive experimental point of view, bilinguals' switching between single items has received most empirical attention in the literature. We therefore first discuss some classical reaction time (RT) studies and the major theoretical interpretations, and then proceed with a more extensive review of ERP studies using this same experimental paradigm. In the second part, we review the (few) studies that examined language switching of words embedded in interconnected discourse, a linguistic context that more closely resembles the context of study of linguistic approaches to language switching (or code-switching). Table 1 presents an overview of the studies we discuss, listing the language switching tasks, the type of bilinguals that were examined, and the main findings.

Table 1. Overview of the ERP studies on language switching (using single words or sentences) reviewed in this paper

Study	Type of task	Language switching task	Nº partici-pants	Type of bilinguals	Main findings
Jackson et al. (2001)	Prod	Naming single digits. Both switching directions	19	Native English speakers with different L2's (French, German, Spanish, Mandarin, or Urdu) and different ages of first exposure to L2. Moderately proficient	N50: Early left fronto-central negativity. N320/N2: Left fronto-central negativity, only in switching from L1 into L2. LPC: between 385 ms and 700 ms at parietal sites, for both switching directions.
Christoffels et al. (2007)	Prod	Naming single pictures. Both switching directions	24	Native German speakers with Dutch as L2. Moderately proficient	N320/N2: Enhanced fronto-central negativity between 275–375 ms. N400: Enhanced fronto-central negativity between 375–475 ms for non-switch trials compared to switch trials ('switching benefit'), only in switching from L2 into L1. Switching effect not markedly different for cognate and non-cognate pictures.
Verhoef (2008)	Prod	Naming single pictures; language cues preceded pictures by 750 ms. Both switching directions	15	Native Dutch speakers with English as L2. Fairly high proficient*	Early posterior negativity (200–350 ms) for switch trials compared to non-switch trials in L2, but not in L1. Late anterior negativity (350–500 ms) for switch trials compared to non-switch trials in both L1 and L2.
Jackson et al. (2004)	Compr	Reading number words. Both switching directions	20	Native English speakers with different L2's (French, German or Spanish) and different ages of first exposure to L2. Moderately proficient	No N2 No LPC

Study	Type of task	Language switching task	Nº partici-pants	Type of bilinguals	Main findings
Alvarez et al. (2003)	Compr	Go/no go semantic categorization task (language switching of word pairs). Both switching directions	28	Native English speakers learning L2 Spanish. Low proficient	N400: for switching from L1 into L2, but not from L2 into L1 Negative deflection at 500 ms in both switching directions
Chauncey et al. (2008)	Compr	Go/no go semantic categorization task (language switching of word pairs; prime masked). Both switching directions	20 (same partici-pants for both experi-ments)	Native French speakers with English as L2. Moderately proficient	N250, particularly in switching from L1 into L2 N400 in both switching directions
Moreno et al. (2002)	Compr	Sentences with final word language-switched. Switching always from L1 to L2	34	English native speakers with Spanish as L2. Fairly high proficient	N400: Enhanced negativity of language switches between 250–450 ms, in regular sentences but not in idiomatic expressions. LPC: Between 450–650 ms and between 650–850 ms, in both regular sentences and idiomatic expressions. Higher L2 proficiency was associated with earlier peak latency and smaller amplitude of LPC.
Proverbio et al. (2004)	Compr	Sentences with final word language-switched. Both switching directions	16	Professional Italian-English simultaneous interpreters. Highly proficient	N400: effect larger in switching from L1 into L2 than in switching from L2 into L1 No LPC

Study	Type of task	Language switching task	Nº partici-pants	Type of bilinguals	Main findings
Brenders (2004)	Compr	Sentences with language-switched word in the final part of sentence. Both switching directions	47	Dutch native speakers with English as L2. Fairly high proficient	N400 effect larger in switching from L1 into L2 than in switching from L2 into L1 LPC: in both switching directions

Note. Prod = Production; Comp = Comprehension

*L2 proficiency level was not assessed, but previous proficiency measures obtained in bilinguals from the same population yielded that these bilinguals are fairly high proficient (e.g., van Hell & Dijkstra 2002).

Language switching with single stimuli: Behavioral evidence

Although language switching is often perceived by bilinguals as requiring little or no cognitive effort, experimental studies indicate that there is a measurable cost associated with switching between languages, in both production and perception (e.g., Costa & Santesteban 2004; Kolers 1966; Li 1996; MacNamara & Kushnir 1971; Meuter & Allport 1999; Soares & Grosjean 1984; Thomas & Allport 2000). Particularly in the past decade, numerous studies have examined how bilinguals switch between series of single numbers, pictures, or words, in order to gain more insight into the mechanisms of lexical selection and cognitive control of languages (for reviews, see, e.g., Meuter 2005; this volume).

In a typical language-switching experiment, bilingual speakers read aloud a series of words alternately presented in their first language (L1) or in their second language (L2), or are asked to name pictures or numbers in their L1 or L2 depending on a particular cue (e.g., the color of the item). In RT studies, the language switching cost is defined as the latency difference between switch trials (in which the language of response changed from that used on the previous trial) and non-switch trials.

In a classical behavioral study, Meuter and Allport (1999) examined language switching in bilinguals with English as their L1 or L2, and either French, German, Italian, Portuguese, or Spanish as the other language. Participants judged themselves to be reasonably proficient in L2. The bilinguals had to name single digits presented against a colored background, with the color cueing the response language (either L1 or L2). Language switches could thus occur from L1 into L2, or vice versa, and were unpredictable (p[switch] = 0.3). The results showed that response latencies on the switch trials were slower than on the non-switch trials. Importantly, the language-switching cost was larger when switching from the weaker L2 into the dominant L1 than vice versa. This effect is referred to as the asymmetrical language-switching cost, and has inspired a wealth of further research. Meuter and Allport (1999) explain their results in terms of the Task Set Inertia interpretation of task-switching. For language production in L2, active suppression of the competing L1 is needed. This active inhibition of L1 may persist involuntarily into the processing of the stimulus for the next trial. When in the next trial a response must be made in L1, this inertia results in a large switch cost. In contrast, for language production in L1, little suppression of the competitor language L2 is needed, and switching into L2 on a subsequent trial does not incur a strong cost. When bilingual speakers are about equally proficient in L1 and L2, language switching costs should be virtually identical, which has indeed been reported (Costa & Santesteban 2004; Meuter and Allport 1999).

Consistent with the notion that on producing a response in one language alternative responses in the nontarget language are deactivated is Green's (1998) Inhibitory Control (IC) Model. The IC model proposes that language task schemas, part of a general language control system that is external to the bilingual lexico-semantic system, control language actions (e.g., to name a picture in L1 or in L2). The language task schemas either inhibit or activate lemmas in the lexico-semantic system, tagged for language-specific information. In order to speak in one language, all active lemmas whose language tags do not correspond to the intended language must be inhibited. For example, if the bilingual wants to speak in the weaker L2, the L2 task schema has to suppress the L1 task schema and must inhibit the L1 lemmas in the lexico-semantic system.

How does the IC model explain language switching, and the asymmetrical language-switching cost? When the speaker switches into the other language, the task schema that is currently active has to be suppressed and the previously inhibited task schema has to be reactivated, which results in a language-switching cost. Asymmetrical switching costs stem from differences in the relative strength of the bilinguals' two languages. Because the L1 is typically stronger and more active than L2, naming in the weaker language L2 requires an active suppression or inhibition of the stronger competitor L1. As L1 is more strongly inhibited and thus requires more time to be reactivated, switching from L2 to L1 is more effortful than vice versa. See for alternative accounts, Finkbeiner, Almeida, Janssen, and Caramazza (2006) and Verhoef (2008).

Meuter and Allport's (1999) study inspired many researchers to further investigate language switching and asymmetrical switching cost, focusing on topics like the role of the relative strength of the switched languages (by varying language fluency in up to four different languages; e.g., Costa and Santesteban 2004; Costa, Santesteban, & Ivanova 2006; Meuter this volume; Philipp, Gade, & Koch 2007), script differences between the switched languages (e.g., Orfanidou & Sumner 2005), or the bilinguals' language learning history and level of proficiency (e.g., Costa and Santesteban 2004). See Meuter (this volume) and Kroll, Bobb, Misra, and Guo (2008) for an overview.

The (few) ERP studies that examined language switching within this paradigm focused on the following questions: What are the neural correlates associated with language switching from L1 (typically the dominant language) into L2 (typically the weaker language), and vice versa? Specifically, how is the asymmetry, observed when switching between languages mastered at varying levels of proficiency, indexed by the distributions and relative amplitudes of ERP components and, if differences are observed, what do they reveal about the cognitive processes believed to underlie language switching? Also, what is the time course of switching between languages?

Language switching with single stimuli: Review of ERP evidence

In ERP studies, switching cost denotes a modulation of an ERP component in response to switch trials compared to non-switch trials. Two ERP studies examined language switching with single stimuli using a production task: digit naming (Jackson, Swainson, Cunnington, & Jackson 2001) and picture naming (Christoffels, Firk, & Schiller 2007; see Table 1). Jackson, Swainson, Cunnington, and Jackson (2001) studied language-switching costs in bilinguals whose native language was English but who spoke either French, German, Spanish, Mandarin, or Urdu as the second language (see Table 1 for more details). Most bilinguals had learned L2 between 13–18 years, some during infancy and some as adults. Self-ratings of L2 proficiency indicated that they were moderately proficient in their L2. In a speeded digit naming task, the bilinguals were presented with single colored digits and had to name each digit in the language cued by the color. The authors used a delayed naming procedure, in which they asked participants to delay their naming response until the digit disappeared from the screen. The series of switch and non-switch trials followed a fully predictable sequence, with two consecutive trials in each language and a language switch on every second trial (a variation of the alternating runs paradigm; Rogers & Monsell 1995).

The response latencies showed a switching cost: Bilinguals were slower in naming digits on switch trials than on non-switch trials. The switching cost was larger for L1 than for L2, but Jackson et al. (2001) did not observe the cross-over interaction as had been obtained by Meuter and Allport (1999). The bilinguals' ERP patterns showed a language switching related modulation of three components assumed to reflect distinct cognitive processes in the course of executing the digit naming language switching task. The ERP responses showed an enhanced early left fronto-central negativity (N50) for switch trials compared to non-switch trials. This early N50 effect likely reflects the detection of a physical change in the visual stimulus: On switch trials, but not non-switch trials, the color of the digit changed from that on the previous trial. The N50 effect is thus not directly related to cognitive processes related to language switching. The ERP responses further showed an enhanced left fronto-central negativity starting at 320 ms after stimulus onset (N320) for switch trials compared to non-switch trials, but this effect was found only when switching from L1 into L2 and not when they switched from L2 into L1. Jackson et al. (2001) interpret this negativity as a frontal N2, a component that in the visual Go/No-Go paradigm is associated with the decision to suppress a response on the No-Go trial (e.g., Konishi et al. 1999; in a Go/No-Go task participants are required to respond to one type of stimulus while withholding the response to another type of stimulus). Recently, however, the N2 has also been associated with response conflict monitoring (e.g., Folstein & Van Petten 2008; Nieuwenhuis, Yeung, van den Wildenberg, & Ridderinkhof 2003). Jackson et al. (2001) propose that switching into L2 requires the active suppression of L1, and that language switching involves frontal brain regions. Since the bilinguals were more proficient in their L1 than in their L2, inhibitory processes may be stronger when switching into L1 than vice versa, in line with the inhibition assumption of Green's (1998) Inhibitory Control Model. Finally, for switch trials (compared to non-switch trials) a sustained increase in the magnitude of the Late Positivity Complex (LPC) was observed between 385 ms and 700 ms after stimulus onset at the parietal sites. This LPC effect was not modulated by switch direction. Jackson et al. propose that this enhanced late positivity (LPC) associated with switch trials signifies executive control of response selection, as this same component has also been observed in a Stroop interference task (Liotti, Woldorf, Perez, & Mayberg 2000).

Christoffels, Firk, and Schiller (2007) also examined language control in a language switching production task (see Table 1). They tested native speakers of German who had studied in the Netherlands for at least 2.7 years, and were moderately fluent speakers of Dutch, as indicated by their mean score on a Dutch lexical decision test and self-ratings of proficiency. Participants were asked to name 48 pictures in German or Dutch (which is a larger set than the single digits used by Jackson et al. 2001). The color of the picture signaled the response language. Here, unlike Jackson et al. (2001) but similar to Meuter and Allport's (1999) original design, the switch trials occurred unpredictably. To examine whether variation in form overlap between translation equivalents modulated ERP patterns of language switching, the pictures to be named were either cognates between German and Dutch (words that are similar in form and meaning, e.g., 'Apfel-appel' [apple]) or non-cognates (e.g., 'Teller'-'bord' [plate]).

The ERP data showed an enhanced fronto-central negativity between 275–375 ms (N2) and between 375–475 ms for non-switch trials compared to switch trials, but this effect was found only for switching from L2 into L1, and not vice versa. Thus Christoffels et al.'s speakers' ERPs showed a switching benefit and not the switching cost observed by Jackson et al. (2001). The behavioral data yielded the typical switching cost pattern in that naming latencies for switch trials were longer than for non-switch trials. However, the switching costs in both directions were similar. In addition, the language switching effects were not markedly different for cognate and non-cognate pictures.

How can these contrasting findings be accounted for? Jackson et al. interpret their data in terms of response inhibition of L1 when switching to L2, but this same mechanism cannot account for the switching benefits Christoffels et al. (2007) observed for switches into L1. Christoffels et al. instead propose that bilinguals do not rely on response inhibition on every single trial but, in mixed language situations such as those induced by the language-switching task, may reduce the level of activation of L1 to facilitate language production in L2 (see also Meuter 2005). As a consequence, a mixed language context has a profound impact on L1 production but hardly on L2 production.

It should be noted, however, that the divergent results of Jackson et al. (2001) and Christoffels et al. (2007) simply may be related to major differences in the design and procedures of the two studies. For example, in Jackson et al. (2001), participants could fully predict the occurrence of the language switches and it is known that the predictability of responses potentially modulates the N2 component (see, e.g., Folstein & Van Petten 2008). Moreover, participants in the Jackson et al. study named a restricted set of single digits, whereas Christoffels et al. used a much larger set of pictures. In neither study were the bilinguals highly proficient in their L2 but those tested by Jackson et al. were highly heterogeneous in terms of the type of L2 and the age of first exposure to the L2. Furthermore, Jackson et al., but not Christoffels et al., used a delayed naming procedure. While such a delayed response procedure prevents EEG recordings from being contaminated by motor artifacts (see, e.g., Krause, Lang, Laine, Kuusisto, & Pörn 1996), withholding a naming response may invite response inhibition processes that potentially modulate the ERPs and that may interact with processes of language control and language switching. Moreover, the fronto-central N2 component has multiple functional correlates (see Folstein & Van Petten, 2008), including response conflict and response selection.

In a recent study, Verhoef (2008) noted that in the studies of Jackson et al. (2001) and Christoffels et al. (2007) the color of the digit and picture indicated in which language the bilingual had to respond, and argues that this results in a confound of endogenous and exogenous control. Building on the task-switch literature (e.g., Rogers & Monsell 1995), Verhoef distinguishes two types of attentional control related to language switching: endogenous and exogenous control. Endogenous control is a top-down, intentional, voluntary process that is driven by a person's internal goals, intentions, or expectancies. Exogenous control is a bottom-up, automatic, involuntary process triggered by an external stimulus. Using the cue-stimulus paradigm in a language switching study, Verhoef recorded cue-locked ERPs to separate endogenous control processes from exogenous control processes (See Table 1). Dutch-English bilinguals were first presented with a language precue, which after 750 ms was followed by a target picture that had to be named. The response language on consecutive trials could be the same (non-switch trials) or different (switch trials). The reaction time analyses showed longer naming latencies on switch trials than on non-switch trials, in the two switching directions. So, the symmetrical switching costs observed in balanced bilinguals (Costa & Santesteban 2004) can also be obtained in unbalanced bilinguals when given sufficient time to prepare for a language switch (and to allow optimal endogenous control).

The cue-locked ERPs showed an enhanced early posterior negativity (200–350 ms window) for switch trials compared to non-switch trials on the L2 trials, but not on the L1 trials. This was followed by an enhanced late anterior negativity (350–500 ms window) for switch trials compared to non-switch trials for both languages. Verhoef (2008) concludes that this study identified two distinct ERP effects related to endogenous language control: an early switch-related negativity between 200–350 ms (for L2 but not for L1), followed by a later negativity between 350–500 ms (in both directions). She takes these effects to imply that the early switch-nonswitch effect for L2 reflects the bilingual's disengaging from the nontarget L1, while the late frontal switch-nonswitch effect reflects engaging in the target L2. Bilinguals can thus orient their selective attention towards the target language prior to a language switch, and bias their naming performance.

Given the conflicting patterns and accounts, additional research is needed to gain more insight into the neural correlates of switching between single items in a naming task, and possible factors that modulate the ERP patterns. The current ERP studies using naming tasks (Christoffels et al. 2007; Jackson et al. 2001; Verhoef 2008) do warrant the conclusion that language switching engages processes of cognitive control at a very early stage in both digit and picture naming tasks within the language switching paradigm, and in bilingual speakers of different languages and with different language learning backgrounds. Moreover, Jackson et al. (2001) also obtained evidence for a late positivity (LPC).

Jackson et al. (2001) and Christoffels et al. (2007) examined language switching between single words in a naming task. Jackson, Swainson, Mullin, Cunnington, and Jackson (2004), Alvarez, Holcomb, and Grainger (2003), and Chauncey, Grainger, and Holcomb (2008) studied language switching of single words during reading. Jackson et al. (2004) tested native English speakers with French, German, or Spanish as their L2. Age of L2 acquisition ranged from birth to adulthood, and self-ratings of L2 proficiency indicated a moderate level of L2 proficiency. Participants were presented with a series of single number words in L1 and L2 and had to decide whether the number word was odd or even by pressing one of two buttons. In the language-switching condition, language-switches occurred on every second trial and were fully predictable.

The ERP data yielded no language-switch related modulations of the N2 component, nor of the LPC. The behavioral data did show a switching cost in L1, but not in L2. Exploratory analyses in the 150–350 time window yielded an enhanced right temporo-parietal negativity (in both languages) and a decreased left central positivity (in L2 only) for switch trials compared to non-switch trials. Exploratory analyses in the 400–500 ms window yielded an enhanced right anterior frontal negativity for non-switch compared to switch trials that reached significance only for the L1 trials. At this point, without further ERP evidence, these switch-related modulation effects observed in receptive language switching are difficult to relate straightforwardly to models of language switching (see Jackson et al., 2004, for some explanations of their data and suggestions for ERP designs to test these explanations). However, the absence of a clear modulation of the N2 and of the LPC is in contrast to the ERP patterns observed in language switching during speech production, i.e., digit naming (Jackson et al. 2001) and picture naming (Christoffels et al. 2007; Verhoef 2008). Jackson et al. (2004) interpret the absence of the modulation of the N2 and the presence of the similar early switch-related negativity for L1 and L2 as an indication that there is no language-specific lexical selection mechanism for receptive language switching. However, this interpretation is difficult to reconcile with the language-specific early left central positivity that was related to language switching. They further suggest that language switching costs, which they did observe in the behavioral data for L1, arise from outside the lexico-semantic system (e.g., the task schema's in Green's (1998) model).

Jackson et al.'s (2004) absence of language-specific ERP components in response to receptive language switching is not paralleled by the receptive language switching studies of Alvarez, Holcomb, and Grainger (2003) and Chauncey, Grainger, and Holcomb (2008). Alvarez et al. studied switching costs using a semantic categorization task in native speakers of English who were beginning learners of Spanish. Participants rated their proficiency in their L2 substantially lower than their L1, which was confirmed by translation performance tasks. ERP responses were recorded to single words in L1 or L2 (presented in a mixed list) that were preceded on the previous trial by a same-language word (e.g., dog – dog or brazo – brazo) or by its translation (e.g., dog – perro or brazo – arm). Participants had to decide if the word referred to a body part, irrespective of language of presentation, and only if it did they had to press a button (go/no-go semantic categorization task). The results showed that the amplitude of the N400 was modulated by language switching, but only when switching from L1 to L2. This asymmetry disappeared in the later ERP component, the LPC. Specifically, after 500 ms post stimulus onset a negative deflection was observed in both language switching directions.

Like Alvarez et al. (2003), Chauncey, Grainger and Holcomb (2008) also examined language switching on words preceded by another word, but in the Chauncey et al. study the target words were preceded by masked prime words (Experiment 1) or briefly presented prime words (100 ms, Experiment 2). These prime words were unrelated to the target word, and could be in the same or in the different language. Conditions were blocked by language of the target. A go/no-go semantic categorization task was used (as in Alvarez et al. 2003). The participants were native speakers of French who were moderately proficient in English. In both experiments, language-switch related modulations of the N250 and the N400 were obtained. In the 175–300 ms window (N250), the ERPs on switch trials were more negative-going than the ERPs in the non-switch trials, particularly when switching from L1 to L2. In the 375–550 ms epoch (N400), language-switching effects were also present, in both switch directions, although there were subtle topographic differences for the two switch directions (see Chauncey et al., 2008, for more details).

The language switch effect found in the N250 after only a very brief exposure to a prime in the other language is a remarkable finding. In a given block of trials, and particularly in Experiment 1 in which the primes were masked, participants were only aware of the targets that were presented in the same language. Chauncey et al.'s findings can be seen as evidence for the brain's automatic and unconscious response to language switches in comprehension. The authors propose that the effects arise from the automatic top down modulation of activation of lexical representations, in line with the original Bilingual Interactive Activation (BIA) model (Grainger & Dijkstra 1992). Specifically, prime words in a particular language rapidly activate the corresponding language node, and this language node then inhibits the representation of all words in the irrelevant language. Where prime and target are in different languages, the language node corresponding to the prime thus also inhibits that target word's representation, leading to a language switching cost.

In sum, the data obtained by Chauncey et al. (2008) and Alvarez et al. (2003) suggest that language switching cost in comprehension does not only arise from outside the lexico-semantic system, as suggested by Jackson et al. (2004) to explain the absence of switching-related modulations of early ERP components and the simultaneous presence of such effects in their behavioral data. Rather, it would appear that at least part of the language switching effect in comprehension stems from fast-acting and automatic modulation of lexico-semantic representations.

The five studies reviewed here, all of which examined ERP patterns in response to language switching (of single numbers, pictures, and words), have yielded a rich set of findings. The study of language switching using the ERP technique is still in its early stages, and the findings obtained so far are far from conclusive, as is also the case in the corresponding behavioral studies (see Meuter this volume) and neuroimaging studies (see Abutalebi & Green 2008). These divergent findings may be at least in part related to the substantial methodological differences across the five studies, including variations in the language proficiency and learning history of the bilinguals, whether or not language switch trials were predictable, the experimental set-up, and variations in comprehension and production tasks. The results are promising, however, and the ERP technique successfully reveals the temporal unfolding of neural events associated with the different subprocesses of language switching. One characteristic shared by all the ERP studies reviewed here is that the bilinguals tested were at best only moderately proficient in their L2. The fact that their ERP responses were different for language switch trials compared to non-switch trials suggests that, at an early stage in L2 learning, L2 learners already have developed control processes related to language switching, at least when responding to individual items. In the next section, we review ERP studies that examined language switching of words embedded in meaningful sentences. As we will see, these studies examined bilinguals that were fairly proficient to highly proficient in their L2.

Switching words embedded in context: Review of ERP evidence

Although the switching of words embedded in a sentence context is the more natural and ecologically valid variant of language switching tasks, to date only a few ERP studies have used whole sentences as stimulus materials (Moreno, Federmeier, & Kutas 2002; Proverbio, Leoni, & Zani 2004; see Table 1). Moreno et al. (2002) asked English-Spanish bilinguals to read sentences for comprehension. The bilinguals were native English speakers with rather high proficiency in Spanish as evidenced by their self-ratings and their performance on a vocabulary test. They were presented with English sentences (e.g. 'Each night the campers built a..') that ended either in the most expected English word (here: 'fire'; non-switch), its Spanish translation ('fuego'; language switch), or a lexically related (and semantically less expected) English word ('blaze'; lexical switch). Half the sentences were normal, moderately constraining sentences, and the other half were idiomatic expressions (e.g., 'Too many cooks spoil the..' [broth/caldo]). Language switching was always from L1 (English) into L2 (Spanish). The type of sentence-final word was unpredictable, as was therefore the occurrence of a language-switch.

Moreno et al. (2002) argued that, if language switching incurs a cost at the level of lexical access and semantic integration, then the language-switched items should elicit an increased N400 response. On the other hand, if bilingual readers treat a switch of language as a change in form rather than a change in meaning, the language-switched items should elicit an enhanced late positivity (LPC). Moreno et al.'s rationale for the latter prediction is that late positivities are associated with the processing of an unexpected or improbably task-relevant event (e.g., Coulson, King, & Kutas 1998; McCallum, Farmer, & Pocock 1984). The ERP patterns associated with the language switched and non-switched sentences showed that the response to language switches in the 250–450 ms window (N400) was more negative than to non-switches, but this effect was only observed in the regular sentence contexts and not in the idiomatic expressions. These language-switch effects in the regular sentences had a left, frontally skewed distribution, which is not typically observed for N400 effects. The response to language switches was more positive than that to non-switches in the 450–650 ms window (early LPC) and in the 650–850 ms window (late LPC), for both the regular and idiomatic sentences. Subsequent regression analyses to examine individual differences among the bilinguals showed that a higher L2 proficiency level was associated with earlier peak latency and smaller amplitude of the posterior late positivity (450–850 ms) elicited by language switches.

Moreno et al.'s bilinguals' ERP responses to language switched and non-switched words embedded in sentences elicited an increased late positivity, but not an unequivocal modulation of the N400. Moreno et al. propose that a language switch occurring in a sentence may not be more difficult to process at the semantic level than a non-switch (as evidenced by the absence of an enhanced N400). Rather, bilinguals may treat a language switch more as an unexpected event at a non-linguistic level, which supports the hypothesis that costs associated with language switching arise from outside the bilingual lexico-semantic system, and may originate in the competition between task schemas that coordinate the output of the lexico-semantic system with the response task. Furthermore, Moreno et al.'s finding that the peak latency and amplitude of the LPC varied as a function of L2 proficiency suggests that the more proficient L2 speakers noticed the language switch earlier, and found the language switch less unexpected and easier to integrate into the sentence structure.

Highly fluent bilinguals, who also frequently used two languages interchargeably, were studied by Proverbio et al. (2004): eight professional Italian-English simultaneous interpreters (all polyglots). Of all studies reviewed in this chapter, these bilinguals are the most fluent L2 speakers. They probably had the most experience with switching between languages given that they are professionally trained and specialized to translate from one language into the other (Christoffels & de Groot, 2005). Proverbio et al. presented incomplete sentence frames in Italian or English ('e.g., 'Global market is facing serious'), about 3200 ms later followed by the presentation of the final word that completed the sentence. This final word was presented either in the other language (language switch; here 'problemi') or in the same language (non-switch; 'problems'), and could be semantically congruent or incongruent with the sentence frame. A large number of target words were cognates, but the authors did not manipulate cognate status nor controlled for this factor. Participants were instructed to read the sentences and target words, and to decide whether the final word was a sensible sentence completion. The different sentences and targets conditions were presented in a blocked design, so at the beginning of a block participants knew the language of the sentences and of the target, hence, language switch trials were predictable.

In the ERP analyses, Proverbio et al. focused on the N1 (between 130–200 ms), the N400 (between 300–500 ms), and the LPC, and found switch-related modulations of the N1 and the N400. No switch-related effects on the LPC were observed. At the left hemisphere sites, but not the right hemisphere sites, the N1 was larger to non-switched sentences than to language switched sentences. Also, only in the semantically incongruent condition a language-switch related modulation of the N1 was observed. The ERP analyses also yielded an increased N400 for language switched sentences compared to non-switched sentences. This N400 effect was considerably larger when switching from L1 into L2 than from switching from L2 into L1. Interestingly, this same direction of switching cost was obtained in the analysis of RTs. This pattern is in the opposite direction of the asymmetrical switching cost reported by Meuter and Allport (1999). However, it parallels the findings of Alvarez et al. (2003) and Chauncey et al. (2008). We will get back to this issue later.

Thus even when bilinguals could perfectly predict the occurrence of a language switch, their ERP responses showed an enhanced N400 to language switched trials as compared to non-switch trials, and their behavioral responses showed longer latencies to switch trials. Unlike Moreno et al. (2002), Proverbio et al. (2004) did not find an LPC effect. It is difficult to compare the results of these two studies directly, however, because of considerable differences in the type of bilinguals studied, the predictability of the language switches, and the instructions given to the participants (i.e., reading for comprehension in Moreno et al. versus sensibility judgments in Proverbio et al.). More research is needed to clarify under which conditions language switching modulates ERP components, but the two studies do indicate that the N400 and the LPC are critical components associated with the comprehension of language switched words in meaningful sentence contexts. Note that a modulation of the N400, but not of the LPC, has also been observed in the studies that examined language switching of single words during reading (see Table 1 for an overview).

The materials of Proverbio et al. were rather abstract sentences extracted from European Union meetings, whereas Moreno et al. used simpler concrete sentences and idiomatic expressions. Several behavioral studies showed that bilingual word reading in sentence context is affected by linguistic characteristics of the sentence context, like the semantic constraint of the sentence, i.e., the extent to which the target word can be predicted on the basis of the preceding sentence context (e.g., Schwartz & Kroll 2006; van Hell & de Groot 2008). Moreno et al. and Proverbio et al. do not provide reports on the semantic constraints of the sentence contexts they used, although it is likely that the semantic constraint of Moreno et al.'s idiomatic expressions is much higher than that of the regular sentences. Another factor known to affect bilingual comprehension is the cognate status of words (see e.g., van Hell & Dijkstra 2002). The stimuli listed by Moreno et al. and Proverbio et al. indicate that their stimuli included cognates and non-cognates as critical target words, but this factor was not explicitly manipulated.

Both these factors, i.e., the semantic constraint of the sentences and the cognate status of target words, were controlled in an ERP study by Brenders and colleagues (2004; Brenders, Dijkstra, & van Hell 2005). Although the main focus of this study was on ERP patterns of lexical access in sentence context, a re-analysis of the data proved to be informative on how ERP patterns of language switched words presented in a sentence context varies as a function of the semantic constraint of the sentence and the cognate status of the switched word. Brenders (2004) examined fairly fluent adult Dutch-English bilinguals, all classroom learners of L2 English who started learning English in the fifth grade of primary school (± age 10). They were visually presented with L1 Dutch sentences followed by an L2 English target word and all-Dutch control sentences (Experiment 1: L1 to L2 switches), or with L2 English sentences followed by an L1 Dutch target word and all-English control sentences (Experiment 2: L2 to L1 switches). Half the Dutch and English sentences had a high semantic constraint (e.g., 'The father took the sick child to the..') and the other half had a low semantic constraint (e.g., 'The mother made an appointment with the..'). Semantic constraint was assessed in prior norming studies. Half the target words were cognates (e.g., 'doctor/dokter'), and half were non-cognates (e.g., 'skirt/rok'). The bilinguals were instructed to read the sentences and target words attentively. Every so often a trial was followed immediately by a comprehension question, answered by pushing one of two buttons (yes or no). Language switch and non-switch trials were presented unpredictably in mixed lists. When comparing across the two experiments, ERP responses showed a larger switching-related modulation of the N400 when switching from L1 into L2, particularly on the non-cognates, than when switching from L2 into L1. A switch-related LPC effect was observed in both switching directions, in both high and low constraint sentence context conditions and in both cognate and non-cognate conditions.

Brenders' (2004) data showed a larger N400 switching effect when bilinguals switched from L1 to L2 than vice versa. This asymmetry was also observed by Alvarez et al. (2003), Proverbio et al. (2004), and Chauncey et al. (2008) on the N400, and by Jackson et al. (2001) on the N320/N2. Brenders' bilinguals also showed a language switch-related LPC effect. An LPC effect was also observed by Moreno et al. (2002), but not by Proverbio et al. (2004). The absence and presence of an LPC in the ERP pattern may be related to the predictability of the language switch. One interpretation of the LPC is that it is related to the processing of unexpected or improbable events (McCallum et al., 1984). Language switches were unpredictable in the two studies that obtained an LPC effect (Brenders 2004; Moreno et al. 2002), but were predictable in the study that did not obtain an LPC effect (Proverbio et al. 2004). Alternatively, it could be argued that this late positivity is an expression of a linguistic process, and indexes sentence-level integration and re-analysis (Friederici 1995; Kaan et al., 2000) or restructuring related to executive control (Kolk & Chwilla 2007). The LPC is assumed to share functional properties with the P600 (see van Hell and Tokowicz, in press, for a review of bilingual studies on syntactic processing). Language switched words presented at the end of a sentence may engage sentence reanalysis, reintegration and restructuring processes, processes that may be less effortful as the bilinguals' L2 proficiency increases. The L2 proficiency of the professional simultaneous translators who did not show an LPC effect (Proverbio et al.) was considerably higher than the L2 proficiency levels of the bilinguals tested by Moreno et al. (2002) and Brenders (2004), all of who showed an LPC effect. Moreover, the simultaneous interpreters are professionally trained to switch between languages and frequently do so in their professional life. Hence, for these interpreters switching between languages may be more natural (see also Meuter, this volume), and integrating language-switched materials may be less effortful. By contrast, the other bilinguals tested may have had to expend more effort in reintegration and reanalysis of the language-switched sentences, yielding an LPC. Consistent with this idea, the relatively proficient speakers in Moreno et al.'s sample showed an earlier peak latency and a reduced peak amplitude of the LPC. Future research should disentangle the effects of L2 proficiency, amount (and perhaps type) of daily switching experience, and the predictability of the language switch for example by comparing moderately and highly proficient bilinguals (discriminated on the basis of frequency of switching experience) who read sentences containing predictable or unpredictable language switches.

Brain regions involved in language switching: Neuroimaging evidence

The main focus of this chapter is on the time course of brain activity associated with switching between languages. Due to its relatively poor spatial resolution, however, EEG is not the optimal method to localize the specific brain areas that subserve language switching. (However, such information can be obtained with high density EEG recordings.) Neuroimaging techniques, such as fMRI or PET, have a high spatial resolution (but a poor temporal resolution) and can thus delineate the cortical structures engaged in language switching. In this section, we provide a selected overview of neuroimaging studies focusing on brain regions involved in language switching. For an extensive and excellent review, we refer the interested reader to a recent paper by Abutalebi and Green (2008), as well as the neural model recently proposed by these authors.

In one of the earliest neuroimaging studies, Price, Green, and von Studnitz (1999) carried out a PET study with English-German bilinguals who performed a translation task and a switching task from English (L1) into German (L2). Switching between languages was related to a specific activation of the left inferior frontal region (BA 44, Broca's area) and bilateral supramarginal gyri (BA 40), and this activation was not present in the non-switch condition.

Hernandez et al. (2000, 2001) studied language switching in Spanish-English bilinguals using fMRI and found that activity of the dorsolateral prefrontal cortex was greater in the switching condition than in the non-switching condition. The prefrontal cortex is assumed to be related to general executive functions such as response switching and response suppression. Hernandez et al. therefore suggested that the prefrontal cortex serves to attenuate language interference that results from actively enhancing and suppressing languages in alternation.

A recent study by Wang, Xue, Chen, Xue, and Donga (2007) is one of the few fMRI studies that compared the neural substrates of language switching from L2 into L1 and vice versa. Using the event-related (ER)-fMRI technique, Wang et al. examined adult Chinese learners of L2 English who performed a language switching task by naming pictures in L1 or in L2. Switching from L1 into L2, but not switching into L1, was associated with increased activation in several brain areas assumed to be related to executive functions and language control (e.g., bilateral frontal cortices, left anterior cingulate cortex, ACC). An analysis of RTs associated with switching revealed that switching into L1 took longer than switching into L2, in line with the asymmetrical switching cost obtained in behavioral research (e.g., Meuter & Allport 1999).

On the basis of their extensive review of neuroimaging studies using fMRI or PET techniques, Abutalebi and Green (2008) argue that language switching engages brain areas involved in cognitive control. Each of these brain areas may contribute distinct and complementary functions to achieve cognitive control related to language switching. The prefrontal cortex, involved in executive functions, decision making, response selection and inhibition, and working memory, is linked to the anterior cingulate cortex (ACC), a brain area involved in the detection of response conflict. Abutalebi and Green (2008) propose that the prefrontal cortex works together with the ACC and the basal ganglia for response inhibition (i.e., to inhibit non-target language interference). Potential response conflicts are signaled by the ACC to the prefrontal cortex, and the prefrontal cortex biases against incorrect language selection. The more anterior part of the ACC may be engaged in withholding a response to the current language and the more posterior part may be engaged in initiating a response in the now relevant language. Abutalebi and Green further propose that the left and right posterior parietal cortices are involved in language switching. In particular, in case of unpredictable language switches, the left posterior parietal cortex biases selection away from the previous language whereas the right posterior parietal cortex may bias selection towards the current language. In case of expected language switches, parietal activity appears to be absent. Finally, it is proposed that the basal ganglia may subserve language planning through a circuitry of the left basal ganglia and left prefrontal cortex, or the basal ganglia may act along with the supplementary motor area (SMA) to inhibit a prepotent response.

ERP studies on language switching: Concluding remarks

The seemingly effortless switching between languages of bilinguals is driven by intricate cognitive mechanisms that we are now only beginning to understand. Research into the cognitive and neural mechanisms underlying language switching is relatively recent. The few studies that examined the electrophysiological correlates of language switching provide valuable information on the timing and degree of neural activation as language switching unfolds over time but, to date, the available empirical evidence is rather scarce and inconsistent. A wide range of language switching tasks in production and perception have been used, varying from switching languages when processing and responding to unrelated single words, pictures or numbers, to the processing of a language switch in a meaningful sentence context. Furthermore, the bilinguals tested across (and sometimes within) the different studies varied in L2 proficiency, in language learning history, and in the amount of daily experience with language switching. Moreover, L2 proficiency was sometimes assessed using self-ratings only, which is not the most reliable measure of L2 proficiency. Another important point of difference across studies was the predictability of the occurrence of a language switch. Finally, the studies reviewed in this chapter did not consider the possible effect of the expectation of having to use two languages may moderate the responses (see Meuter 2005 for a more extensive discussion on the necessity of task-specific baselines).

The overview of these studies in Table 1 indicates that the result patterns vary, and that the evidence as of yet is inconclusive (as, by the way, is also true for behavioral and linguistic studies on language switching; see, e.g., Meuter, this volume). More empirical work is needed before we can draw firm conclusions, but the currently available ERP evidence does point at some patterns.

Three major ERP components associated with language switching emerged from the studies reviewed in this chapter are: the N2, N400, and LPC. The N2 is believed to index cognitive control but, as we explained, there is still some debate as to its exact functional significance (response selection, response conflict monitoring, or response inhibition). The language switch-related modulation of the N2 suggests that language switching engages processes of cognitive control at a very early stage in the perception or production of a language switch (starting around 275 ms after stimulus onset). How the precise underlying mechanisms of these early language control processes work is still an open question: Jackson et al. (2001) observed a switching cost when switching into L2, whereas Christoffels et al. (2007) observed a switching benefit when switching into L1.

Several studies observed a modulation of the N400 in language switching compared to situations where the language remained unchanged (Alvarez et al. 2003; Brenders 2004; Chauncey et al. 2008; Proverbio et al. 2004). This N400 modulation indicates that a second component process of language switching entails a fast-acting lexico-semantic integration process. Interestingly, all ERP studies that compared switching into L2 versus switching into L1 observed higher switching cost when switching from L1 into L2 than vice versa, suggesting that lexico-semantic integration is more difficult when processing an item in the weaker language (L2) compared to the stronger language (L1). This asymmetry in switching cost observed in the N400 contrasts with the asymmetry observed in behavioral studies. We will come back to this issue shortly.

The lexico-semantic integration process in language switching can be indexed by a third component associated with language switching, namely the LPC. The LPC is correlated with the processing of unexpected or improbable task-related events, and is believed to index sentence-level integration or reanalysis, as well as restructuring processes related to executive control. Remarkably, LPC effects were obtained in studies with both expected (Jackson et al. 2001) and unexpected (Brenders 2004; Moreno et al. 2002) language switches. How language switching patterns are modulated by expected versus unexpected language switches is one of the issues that need more empirical attention, as we noted earlier. Another factor that deserves more attention in the context of the LPC is the role of relative language proficiency. Specifically, Moreno et al. observed that the peak latency and peak amplitude of the LPC varied as a function of L2 proficiency, suggesting that more proficient L2 speakers noticed the language switch earlier and experienced the switch to be less unexpected that the less proficient L2 speakers. The idea that less proficient bilinguals experience more effort in integrating language switches into the sentence context is corroborated by the fact that Moreno et al.'s (2002) and Brenders (2004)'s moderately proficient bilinguals (who were also less experienced at language switching) showed an LPC effect, whereas Proverbio et al.'s (2004) highly fluent, professional simultaneous interpreters did not. L2 proficiency-related qualitative and quantitative differences in ERP patterns have also been observed in another domain of bilingual processing, morphosyntactic processing in L2 (for a review, see van Hell & Tokowicz, in press). One direction for future ERP research on language switching, and other domains in bilingual processing, is to further examine the role of L2 proficiency.

Another intriguing finding in the ERP studies is the switch-related modulation of the N400, where switching into L2 was associated with a higher switching cost than switching into L1. The direction of this asymmetry contrasts with the pattern observed in many behavioral studies in which switching into L1 is associated with higher switching costs (for a review, see Meuter this volume). How can we reconcile the apparent different directions of language switching costs observed in (many) ERP studies and (many) behavioral studies? As we noted at the beginning of this chapter, one advantage of the ERP technique is that it provides insight into temporal dynamics of language switching as it unfolds in real time. Behavioral studies (using, e.g., reaction times and percentage errors), on the other hand, measure the end-state of the process, i.e., the moment a language switched item is produced or recognized. The asymmetrical switching cost related to the N400 occurs early in the language switching process, and may reflect the more effortful but fast-acting lexico-semantic integration of an L2 word. The fact that this asymmetry crosses over in the behaviorial studies (with nonbalanced bilinguals) suggests that the asymmetrical switching cost observed there reflect, not earlier subprocesses of language conflict, lexico-semantic integration and sentence-level integration as language switching unfolds in real time, but rather a later stage in processing related to decision making or response preparation (e.g., Thomas & Allport 2000).

ERP studies on language switching: future studies

The theoretical framework of the ERP language switching studies reviewed in this paper only encompasses cognitive models of production and perception that have been developed to explain or fine-tune the language switching of single unrelated pictures, numbers, or words. This is true not only for studies in which bilinguals switched between single, unrelated pictures, numbers or words, but also for studies in which language-switched words were embedded in a meaningful sentence context. In addition to focusing on further refinement of cognitive models of language production and perception, future ERP studies (and cognitive, behavioral studies, for that matter) also should attempt to test the wealth of theoretical models developed within linguistic approaches to language switching, for example, the triggering theory (Broersma & de Bot 2006; Clyne 1980; de Bot, Broersma, & Isurin, this volume), theories that emphasize syntactic equivalence or congruence as a constraining factor in the occurrence of language switches (e.g., Deuchar 2005; Muysken 2000; Poplack 1980; Poplack & Meechan 1995), or the Matrix Language Frame model and the 4-M model (Jake & Myers-Scotton this volume; Myers-Scotton 2005, 2006).

One of the theories originating from linguistic corpus research that can easily be extended to issues related to neural and cognitive processing is the triggering hypothesis (Broersma & de Bot 2006; Clyne 1980; de Bot, Broersma, & Isurin this volume). In short, the lexical triggering hypothesis claims that cognate words can facilitate or trigger a switch to the other language. In a recent study, we examined the neural correlates of lexical triggering, and extended the basic idea to socio-contextual triggering (Witteman & van Hell 2008). We aimed to study whether these two types of triggers can modulate the switching costs traditionally associated with switching between languages. In the lexical triggering study, we asked Dutch-English bilinguals to read sentences containing a language-switched word preceded by a lexical trigger (e.g., the Dutch-English cognate 'supermarket' in the sentence 'This famous supermarket also sells speelgoed to its customers'; [toys]) or preceded by a non-trigger word (here, the noncognate 'store' in 'This famous store also sells speelgoed to its customers'). We conducted three experiments (with different groups of Dutch-English bilinguals). In Experiment 1, bilinguals read Dutch (L1) sentences that contained an English (L2) language-switched word using a self-paced reading task. In Experiment 2, the same materials were presented in an EEG study. Experiment 3 used the same self-paced reading task as Experiment 1, but now the sentences were in the bilinguals' L2, and the language-switched words in L1. Experiment 1 showed no reduced switching cost of language-switched words as a function of lexical triggering. The ERP study yielded the same results: ERP responses to language-switched words were not modulated by the trigger manipulation. However, when the language-switched words were in L1 and the sentences in L2 (Experiment 3), reading latencies of the language-switched words were shorter when these words were preceded by a cognate trigger compared to a noncognate trigger. This indicates that bilinguals' sensitivity to lexical triggering effects in language switching is affected by their proficiency in the two languages.

In the socio-contextual triggering study, we asked three new groups of bilinguals from the same population to read a discourse context that describes a more English-like or Dutch-like situation ('For your daily groceries you can go to Wal-Mart/Albert Heijn'), followed by a sentence that contains a language switch ('This famous store also sells speelgoed to its customers'). Again, we conducted three experiments. In a behavioral experiment (Experiment 1) and an ERP experiment (Experiment 2), the socio-contextual triggering sentence was in Dutch (L1) followed by a Dutch sentence that contained an English (L2) language-switched word. In the third (behavioral) experiment, the sentences were in English (L2) and the second sentence contained a Dutch (L1) language-switched word. Experiment 3 yielded no significant effects of socio-contextual triggering, but the other two experiments did. In Experiment 1, bilinguals were significantly faster to read the language-switched (L2) word when it was preceded by an English-like (L2) situation (e.g., Wal-Mart) than when it was preceded by a Dutch-like (L1) situation (e.g., Albert Heijn). The ERP experiment showed a comparable pattern. The N400 was less negative-going when the L2 language-switched words were preceded by an L2 socio-contextual trigger compared to an L1 socio-contextual trigger. Together, the lexical triggering and the socio-contextual triggering studies show that switching costs can be modulated. More generally, these studies show that linguistic theories that have been developed on the basis of corpus research can be successfully tested in a laboratory situation, using different tasks.

Other important future research topics include the extent to which ERP patterns associated with language switching differ for expected versus unexpected language switches, whether the patterns of language switching vary with the bilinguals' likelihood of switching between languages in their everyday life, and how electrophysiological correlates of language switching are affected by the degree of similarity between languages (e.g., switching between same script versus different script languages, variations in the number of cognates in the two languages, and the phonological and orthographic overlap of language-switched items). It is also important to gain more insight into the role of the bilinguals' relative language proficiency in the two (or more) languages used (or switched between), and the impact of variations of L2 proficiency on language switching. Studies that focus on syntactic processing in bilinguals indicate that variations in L2 proficiency are associated with both qualitative and quantitative variations in EEG brain responses (for review, see van Hell & Tokowicz, in press). The present review of ERP studies on language switching indicates that ERP patterns associated with language switching also vary with L2 proficiency, similar to what has been reported in behavioral studies on language switching (see Meuter, this volume, for a review). Future cross-sectional or longitudinal ERP studies tracking language switching performance over time would allow us to better understand changes in neural activity and cognitive processes associated with developing proficiency in L2. Moreover, future ERP studies may seek to examine more naturally occurring and ecologically valid language switches, for which the linguistic corpora of code-switches are potentially very helpful (see Gardner-Chloros, this volume, for further reference on incorporating naturalistic data into sociolinguistic and psycholinguistic analyses).

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CHAPTER 4

Sources of triggering in code switching

Kees de Bot, Mirjam Broersma and Ludmila Isurin
University of Groningen/ Radboud Universiteit Nijmegen/
Ohio State University

In this contribution the focus is on triggering in code switching. The perspective taken here is a dynamic one and code switching is seen as a process of self-organized criticality, a concept from Dynamic Systems Theory that describes and explains sudden changes in systems. Triggers, words that are similar in form and meaning appear to play a role in code switching in the sense that they enhance the chance of a code switch, but do not predict every single event. So there can be code switching without a trigger, and there may be triggers that do not lead to switches. Triggers may lead to switches in parts of the language production system, but not necessarily all parts. So an utterance may be in one language on the word form level and in another language at the syntactical level.

Keywords: code switching, psycholinguistics, dynamic systems theory, triggering,

Introduction

Decades of research have taught us a lot about why people code switch in certain situations, but it is still largely unclear why particular instances of code switching occur where they do. There is abundant evidence for general effects of language proficiency, interactional setting, group affiliation, typological distance between languages and various other factors that affect global patterns of Code Switching (CS). But how these general factors are related to actual switches is unclear and according to Sankoff (1998) it is not possible to predict each and every switch:

> 'Even if we can determine where a code-switch can occur and where it cannot, there is no way of knowing in advance for any site whether a switch will occur there or not. In particular, if a switch occurs at some point in a sentence, this does not constrain any potential site(s) later in the sentence either to contain another switch or not to – there are *no forced switches*.' (39, italics in original)

Still, we would want to know what the limits of this unpredictability are. There may be real time factors that have a direct impact on the language used in speech in a setting in which CS is a normal and generally accepted phenomenon. In this contribution we want to try and develop a general framework for triggering in CS, taking Michael Clyne's earlier work (1980,1987) and our own elaboration of these ideas (Broersma & de Bot 2006) as a starting point. We want to develop these ideas further by moving from a purely lexical approach to CS to a more general system based approach that takes into account different types of triggers and their interaction. First, we want to argue that CS is a very special type of bilingual language use and that it shows characteristics of what in physics has been described as a 'critical state'.

CS as a critical state

In bilingual language production, speakers will in most cases stick to the language that is most appropriate in a given setting. In some settings the use of more than one language may be called for. In that sense, CS is a normal way of speaking for many bilinguals but not the default in bilingual language production. Consequently most of the research on this is only indirectly relevant for our understanding of bilingual processing. It is a unique setting in which both languages - if we restrict ourselves to bilingual as opposed to multilingual situations – are activated to a very high level. Both languages are in Green's (1993, 263) terms 'selected', that is, controlling speech output. In a CS setting switching between languages is the conversational norm, which means that there is a constant need to switch. The amount and type of switching is highly dependent on the conversational setting. In some settings minimal CS, such as pronouncing a word using the sounds of the other language, is enough to signal group adherence, in other settings longer stretches of speech are switched. This means that the social setting will push the language system in a critical state, that is, close to phase transition. In physics a whole field of research on phase transition has emerged and there is growing interest in what has been labeled 'Self-organized Criticality', a concept that has been coined by Bak, Tang & Wiesenfeld (1987) and developed further in Bak's (1996) book '*How nature works. The Science of self-organized criticality*'. The central idea is that systems develop through interaction with their environment and through internal reorganization and tend to be attracted to critical states in which a minor change can have unpredictable effects on the system. The metaphor Bak used was that of a sand pile: sand is dripping onto a smooth surface and forms a pile. As grains of sand are added one after the other, the slope of the pile will get steeper and steeper. Then at some point, adding one more grain of sand will cause an avalanche. When an avalanche will take place, how big it will be and where it will go cannot be predicted. After each avalanche, the system will be in a temporary state of balance till the next avalanche occurs. Self-organized criticality (SOC) is a property of (classes of) dynamical systems which have a critical point as an attractor state. To quote Bak:

> 'I will argue that complex behavior in nature reflects the tendency of large systems with many components to evolve into a poised, 'critical' state, way out of balance, where minor disturbances may lead to events, called avalanches, of all sizes. Most of the changes take place through catastrophic events rather than by following a smooth gradual path. The evolution to this very delicate state occurs without design from any outside agent; the state is established solely because of the dynamical interactions among individual elements of the system: the critical state is *self-organized*. Self-organized criticality is so far the only known general mechanisms to generate complexity.' (Bak, 1996, 1–2)

A host of research has been carried out on SOC since Bak et al.'s paper in 1987. A Web of Science search using SOC as the search term yielded more than 300,000 publications, several hundreds of them published in the last few years. Bak's ideas have been applied in many different fields, ranging from economics to epidemics, and visual attention to landscape formation. While the mathematics of SOC are well beyond the scope of the present contribution, some of the thinking on SOC seems to be applicable to the study of language development and language use, and in particular CS. It can be argued that in a CS setting, the individuals' language system tends to be attracted to a critical state in which the transition from one state (speaking language A) to another state (speaking language B) appears to be highly unpredictable, but not random. Many different sociolinguistic and psycholinguistic factors interact in the selection of the language of a specific utterance or part of that. But even if we accept that this line of thinking supports Sankoff's assumption on the unpredictability of CS, we still want to find out what might have led to a specific set of switches. Even if we cannot predict specific CSs, we may learn more about the phenomenon by looking at it 'retrodictively' to use Larsen-Freeman's (2007) term, that is, we may be able to look back at what happened and point out what factors may have played a role in a specific instance, but we cannot claim that the same set of factors will lead to the same outcome next time they occur.

The concept of SOC forces us to distinguish cause and reason carefully: The single grain of sand can be the cause of an avalanche, but it is not the reason why avalanches take place. Steepness of the slope of the pile, adhesive forces between grains of sand and structural characteristics of the pile are all important reasons for the kind of adjustments that avalanches are. The final grain of sand triggers the avalanche. Likewise, a set of psycholinguistic (such as availability of elements) and sociolinguistic factors (such as being in a setting in which CS is the conversational norm) make people codeswitch, but they do not necessarily define why a particular CS takes place at a given moment and what form it takes. It should be pointed out here that the language system of a bilingual is always in a critical state: depending on the setting, only one of the languages may be used, but in settings in which CS is either the norm or there are no restrictions on the use of more than one language, the systems will move into a state in which a switch is about to take place. Various factors may interact to make a language system critical and very sensitive to minor changes that might lead to a phase change or code switch. There may be many phenomena that trigger a CS. Given the critical state of the system, a minor change in one of its subsystems may cause a switch to a smaller or larger chunk in the other language. A sound from the other language, the thought of an event specific to a particular language setting, the occurrence of a word, sound, gesture or construction from the other language may be enough to make the system switch and in this sense lead to a change of state of the system. As Marian (this volume) suggests, there may be switching due to the recollection of an event that was encoded in a specific language. In other words, the grain of sand is analogous to the trigger and the switch to an avalanche. The specific configuration of interacting variables will be very idiosyncratic: all the individual's experiences are reflected in her present state, and what may be a trigger for one individual may have no effect at all for another individual.

Code switching as state phase transition

In physics there is a world of research on phase transformations, such as the change of ice into water or gas into a fluid state. In the study of systems, the idea of state phase is used more widely to describe changes of systems over time, like the change from liquid to gas. A change of the language system that leads to a switch can be seen as a state phase transition from language A to language B. Triggering can have the effect that at all levels or just on a minor local level the system changes phase. Following ideas on SOC, the impact from a specific trigger can not be predicted, but the effects are assumed to follow a power law function which states that over longer periods of time and many iterations, there will be many small changes, and a small number of larger ones. The essence of this line of thinking is that the larger ones are not simply outliers, but part of a normal pattern and therefore do not need a special explanation.

Triggering in the individual's language system

As mentioned earlier, various sociolinguistic factors have an impact on CS. Here we want to focus on factors within the individual speaker and their potential role as triggers. In order to understand at what level in the system triggering can play a role, we have to discuss briefly the main components of the language production systems, according to the original production model proposed by Levelt (1989, 1993). Language production starts at the conceptual level where the communicative intentions are formulated in a set of lexical concepts. These concepts are then matched with lemmas in the lexicon on the basis of meaning. Meanings can be expressed in different ways: through words, gestures, suprasegmentals and syntax. The activation of a lemma will lead to the activation of a specific word form (or "lexeme") and the activation of syntactic procedures based on the grammatical functions of the selected elements. How suprasegmentals and gestures are activated is not completely clear. The activation of the syntactic procedures will lead to a syntactic frame in which word forms will be inserted. A phonetic plan is formed that contains information relevant for the motor programs that lead to the production of speech. In that process, both syllables and sounds (or phonemes) play a role.

Language selection is assumed to be part of the conceptual information relevant for language production (de Bot & Schreuder 1993, Poulisse & Bongaerts 1994). It is now generally accepted that the communicative intention at the conceptual level also implies a language choice that has to be coded in the message and conveyed to other levels of the system. This does not mean that this is the only source or locus of language choice. As Kroll et al. (2006) have argued, 'Language selection depends on a set of factors that vary according to the experience of the bilinguals, the demands of the production task, and the degree of activity of the non-target language.' (119).

We propose that in particular in situations in which CS is normal, language selection is not purely a top down activity caused by factors like stylistic constraints or relative availability of elements. Selecting an element from the other language may lead to the activation of elements from that language at other levels. At different stages of the production process, elements have to be selected. The most important ones are the lexical concepts, words, syntactic procedures, discourse, gestures, syllables and sounds. At each of these levels there are stores of elements. At the lexical level, there will be lexical items that are organized in one large network consisting of language specific networks that are formed on the basis of use (Paradis 2004). Elements that are shared by two or more languages are part of the networks of these languages. Such networks are likely to be present at other levels: there may be networks of syntactic procedures or syllables that are partly language specific and partly shared by different languages. It is also assumed that there are links between elements from the same language at different levels with activation of elements at one level leading to activation at other levels (Costa & Caramazza 1999, de Bot 2004). One aspect of the kind of models we are using here is that activation of an element from language A that is shared by two languages will lead to the activation of other elements from language B both within and between levels.

Figure 1 attempts to visualize the links between and within levels. In this figure, the 'monitor' represents the part of the system that is involved in the activation of language-specific subsets on different levels. The monitor controls top-down language selection and acts as a collector of information about activation on different levels. Following Kroll et al. (2006), it is assumed that language selection involves the interaction of both top-down processes and bottom-up processes. So language selection at a local level (For example the syntactical level or the sound level) influences and is influenced by activation and selection at the conceptual level.

Note that in our representation of the bilingual production process, no separate lemma level is assumed: it is assumed for the moment that the lemma has no content, serves as a switch board between forms and meanings. Or to use Sanchez-Casas & Garcia-Albea's words: 'The lemma level (….) could be considered a means to reflect activation patterns that result from word form to word meaning mappings'(2005, 239). Lemmas serve to connect the meaning part in the lexical concept with the word form and the syntactic procedures generated by the syntactic functions to be expressed. So in that sense, lemmas are not representations themselves, they only exist as links between representations at the lexical conceptual, syntactic and word form level. It may be the case that lemmas are also connected to gesture representations (de Ruiter 2000). With respect to language selection, it could be argued that the activation of a lemma activates the language specific subsets at the other levels. The same argumentation holds for what could be the word level. In this model words are seen as the link between conceptual meaning and form, be it written or spoken. The activation of a specific conceptual meaning leads to the selection of specific forms, without an intermediate representational form. Similarly in perception certain sound/word combinations directly activate specific meanings at the conceptual level.

In Figure 1, the shaded circles refer to different languages and their overlap at different levels. In the present state of the language system as represented by this picture, L_b is the dominant language at all levels. As will be argued later on, it is not necessarily the case that the same language is dominant at all levels.

The model presented so far will be the basis for our treatment of triggering. We focus on the shift of dominance of languages at different levels. Let us assume that one language is dominant as in Vigure 1. This will be evidenced by the production of L_b elements at all levels: concepts, words, syntax, discourse, gestures, syllables and sounds are all typically L_b. Then a minor change may lead to a state

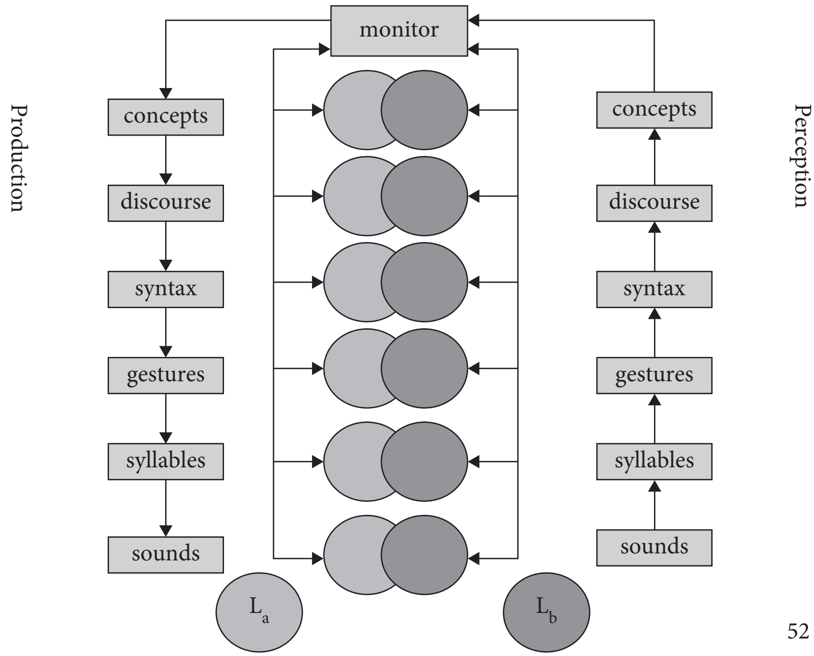


Figure 1. connections within and between levels in the production and perception system

change at one level: e.g. the use of a gesture that is very clearly from L_a. Seeing that gesture or performing it activates the L_a gesture subset and L_a becomes dominant on that level. What happens then is unpredictable: it may be that speech is produced that is typically L_b at all levels apart from the gesture level: gestures are from L_a. The other possibility is that the "avalanche" affects the other levels and that through the activation of the L_a gestures set, the sets of words, syllables and sounds from L_a are activated as well. In this case seeing L_a gestures is the trigger that leads to CS at various other levels.

Co-activation of elements at different levels

For triggering along the lines mentioned in the previous sections to take place, we have to assume that there is co-activation of elements from different languages at the levels we discussed to far. The amount of evidence for shared representations is rather uneven for different levels: while there is a large set of data on lexical aspects, there is hardly any evidence for the sound and gesture level. Clyne (2003) presents examples of triggering at the syntactical and suprasegmental level, but statistical evidence for triggering so far only comes from the lexical level. Below we will first describe triggered code switching at the lexical level, and then discuss how triggering might play a role at the other levels.

The word level

There is now sufficient evidence to show that cognates, words sharing the same form and meaning in two languages appear to act as triggers in CS. Broersma & de Bot (2005) building on earlier work on triggering by Clyne (1980) provide evidence for this, using data from two CS corpora. Their data show that clauses containing a trigger word are more likely to include a CS than clauses without a trigger word. The exact locus of this effect is not entirely clear yet, nor do we know whether for triggering there has to be both form and meaning overlap. A comparison of, first, cognate words that share form and meaning with, second, false friends that only share the form but not the meaning (e.g. coin in French and English) and, third, close translation equivalents that overlap in meaning but not in form should help to solve this issue.

Another remaining question is whether parts of words can also act as triggers. E.g. a written word like 'refrigerator' in English contains letter combinations that are Dutch words ('tor' [beetle] and 'rat' [rat]). Research on priming has shown that such 'hidden' words still play a role in production (Oliphant 1983), but whether they have an impact on triggering is unclear. In speech production, the phonologically embedded words might be more important than orthographically embedded words.

Following Levelt et al. (1999), we assume that language production is based on a syllabary which contains language specific subsets, but also a set that is shared by specific languages (e.g. 're-' and 'de-' in English and Dutch). If triggering results from shared representations, it is likely that the shared syllables act as triggers. But that would lead to a constant and complex process of priming which cannot be studied systematically.

It is also unclear what the status of bound morphemes is with respect to shared representations. Is there a set of morphemes for each language with overlap between the sets? Or are morphemes again primarily switch boards between word form representations and syllables? In the Levelt model, word forms consist of the motor programs needed to produce the words. At this stage, there is no data suggesting that there is a specific morpheme level.

The lexical concept level

To assess the possibilities for triggering at the level of lexical concepts, we will first consider which concepts might co-activate each other, and might thus trigger a CS. The research on co-activation at the lexical concept level has focused primarily on the co-activation of translation equivalents in two languages[1] (e.g. de Groot, Dannenburg & van Hell 1992, de Groot & Poot 1997). There is a whole line of research on between-language priming with cognate and non-cognate translation equivalents. In this research, various tasks have been used, including semantic categorization (apple; 'is this a fruit?') and lexical decisions ('is this a word?') with priming. Williams (1994) varied the amount of semantic overlap between prime and target. With masked priming, he found between language priming effects from L1 to L2 for translation equivalents and pairs that were semantically highly similar but not translation equivalents (English 'fence'-French 'haie'). Thus, semantically similar words from different languages activated each other. No masked priming effects were obtained when the pairs had relatively low semantic similarity, for example 'shoe-pied', whereas such pairs did produce an effect when primes were unmasked. Apparently there are limitations on the semantic activation produced by masked words. In a related study, Grainger & Frenck-Mestre (1998) studied the effect of very brief (29–43 ms) masked priming on non-cognate translation equivalents in a semantic categorization task and a lexical decision task. It turned out that there was a priming effect, but the effect was larger in the semantic categorization task than in the lexical decision task. These findings suggest that non-cognates can co-activate each other as well, and can thus act as triggers, but the Williams (1994) study suggests that there will be an effect of degree of semantic overlap.

How much overlap is needed for priming or triggering to take place is not clear, if only because there are no clear measures of semantic overlap. Although the findings are not completely conclusive, the general trend seems to be that activation of a word may also lead to the activation of its translation equivalent. Words from two languages may show a high level of overlap in meaning, e.g. words like 'maar' and 'but' in Dutch/English are very similar, both in meaning and in the patterns they appear in. The line of argumentation here could be as follows: In the conceptualizer all concepts that show a certain degree of overlap in meaning will be co-activated. Since 'but' and 'maar' show such extensive overlap, it might be argued that one co-activates the other. Several issues arise then: how much overlap

1. Here we are faced with the problem that we claim that CS is a very specific situation with generally two almost equally highly activated languages while most experiments on bilingual production have been done with tasks in which languages had to be kept separate and speakers were not habitual CSers. Note also that in those data, 1st and 2nd year psychology students from the Universities of Nijmegen and Amsterdam are heavily overrepresented.

is needed for co-activation? Is there some minimal threshold to be reached before such co-activation takes place? Assuming that 'language' is part of the conceptual make up of a lexical concept, does that information block co-activation, or is a certain level of overlap needed to compensate for the mismatch caused by the different language label?

It could be argued that we cannot really establish on an individual level what the amount of overlap is on the conceptual level. Even for words that in corpora show similar patterns of use, suggesting similar meanings and functions, the individual pattern of use and the episodic marking may be such that ultimately the two concepts are not similar enough to fully activate the word in the other language and therefore trigger a switch. Of course, more or less the same argumentation can be set up for overlap at all other levels.

Number words and color names, that have been claimed to be among the words with the most complete semantic overlap (Laheij et al., 1996, Duyck & Brysbaert, 2008) might make good examples to look at triggering effects on the semantic level.

For the assessment of semantic overlap it may be useful to take existing semantic feature production norms as a starting point. McRae, Cree, Seidenberg & McNorgan (2005) gathered semantic feature production norms for 541 living and non-living basic concepts from 725 participants. The data contain lists of standardized features and information about word frequency and positional frequency. Comparison of norms for translation equivalents in two languages would allow assessing semantic overlap between languages. Of course the data that McRae et al. collected are based on native speaker norms and it is not clear to what extent such norms are also valid for L2 learners. An alternative and also promising approach to this is mentioned by Kaji (2005) who used context information to measure degree of overlap in meaning in corpora in two languages. This seems a reliable method, probably more reliable than e.g. judgments since it is based on real use rather than interpretations. At the same time, the degree of overlap is likely to show a highly individual pattern, and generalized findings from corpora may not align with individuals' patterns.

The syntactic procedures level

Clyne has been suggesting for many years that shared syntactic knowledge and compromise forms that are made similar in two languages may act as triggers. He presents some examples of Dutch-English and Serbian-English patterns of syntactic convergence that facilitate switching (2003, 177–179). Recent research supports the assumption of shared representations of syntactic structures in different languages. Hartsuiker, Pickering & Veldkamp (2004) carried out a syntactic priming experiment in which participants who were intermediate to high level Spanish learners of English had to describe pictures after being provided with a verbal cue from a confederate. The cues were given in Spanish, while the descriptions of the pictures had to be given in English. The critical contrast was the use of active vs. passive constructions by the confederate and the effect this had on the proportion of use of passives by the participants. The results showed that the confederate's use of the passive in Spanish had an impact on the participants' use of the passive in English. Earlier work on syntactic priming between languages by Loebell & Bock (2003) had found no priming between English and German passives. Hartsuiker et al. assume that 'it might be that the syntax of particular constructions is shared between languages only if it is formed in the same way in both languages' (412). They also conclude that 'both word meaning and word syntax are points of contact between languages' (413).

In a similar vein, Desmet & Declercq (2006) used syntactic priming to look at the impact of the use of high and low attachment in Dutch and English sentences like:

'De docent adviseerde de leerlingen van de leraar die….'

'The lecturer advised the students of the teacher who….'

In Dutch, like in English, these sentences are ambiguous, though there is a preference that is language specific (high attachment: 'die' refers to 'de studenten' in Dutch). By using similar constructions that are non-ambiguous through gender marking, high and low attachment primes were constructed like:

'De man zag het meisje met de jongens dat/die…

'The man saw the girl with the boys who….'

Here 'dat' can only refer to the girl, and 'die' to the boys. In a number of experiments Desmet & Declercq showed that there is a systematic priming effect both within and between Dutch and English. By looking at the attachment preferences they could show that syntactic priming also occurs when the priming is not primarily lexical. The studies discussed here provide evidence for a shared representation for similar syntactic constructions in bilinguals and therefore make a triggering effect in CS on the basis of shared syntactic structures likely.

The discourse and gesture level

It is not inconceivable that languages are also linked at the discourse level or at the level of gestures, but there is no research so far to even begin to substantiate such claims. The discourse level is here defined as the set of regularities above the sentence level, and includes sociopragmatic and pragmalinguistic patterns. It might be the case that a particular way of hedging in request formulations is shared by different languages while other patterns are more language specific. Such shared patterns might then act as triggers. It would be very interesting to test whether shared gestures (co-speech gestures, but in particular emblems, see Kendon, 2004) have a triggering effect on CS. At the moment, it is rather unclear how discourse or gestures fit in a model of language production (see de Ruiter, 2000, for an interesting approach using the Levelt model as a starting point for gestures). If gestures have an effect on triggering then they can be assumed to be closely linked to parts of the production system where language choice has an impact.

The syllable and articulatory level

The fact that adults in particular have real problems mastering the pronunciation of a foreign language and the prominence of foreign accents in language learners supports the view that at this level the two systems are not completely separated. Flege & Fletcher (1992) show that the perception of a foreign accent is influenced by a complex set of speaker and listener characteristics, and that there is adaptation to specific foreign accents, which implies an increased overlap of realizations and many representations.

Languages seem to be less clearly differentiated on the syllable and phoneme level than on other levels. In many CS settings the two languages at play tend to converge on this level more than on other levels. E.g. in the speech of Dutch migrants in Australia studied by de Bot & Clyne (1989) there are many words that are pronounced more or less similarly in Dutch and English, in particular cognate words like *dat/that*, *and/en*, *by/bij*. Also words that are, at the syllable level, clearly linked to one language may actually be produced with sounds that are either compromise forms between the two languages, or belong to the other language. A good example is the pronunciation of the letter <w > which is pronounced as a labiodental in Dutch and a bilabial in English. In their Dutch, the migrants use the bilabial predominantly. The fusion of the systems from two languages probably has a reduced triggering effect, because there is hardly a language specific subset left that can be activated. Still, research needs to be done to detect any possible triggering effects at this level.

Tones can also act as triggers. Ho-Dac (1996, in Clyne 2003) presents data on the impact of tones in CS in Vietnamese-English bilinguals in Australia. He shows that tones that are likely to equate to English pitch and stress can act as triggers: such tones precede switches more often than tones that differ from English ones.

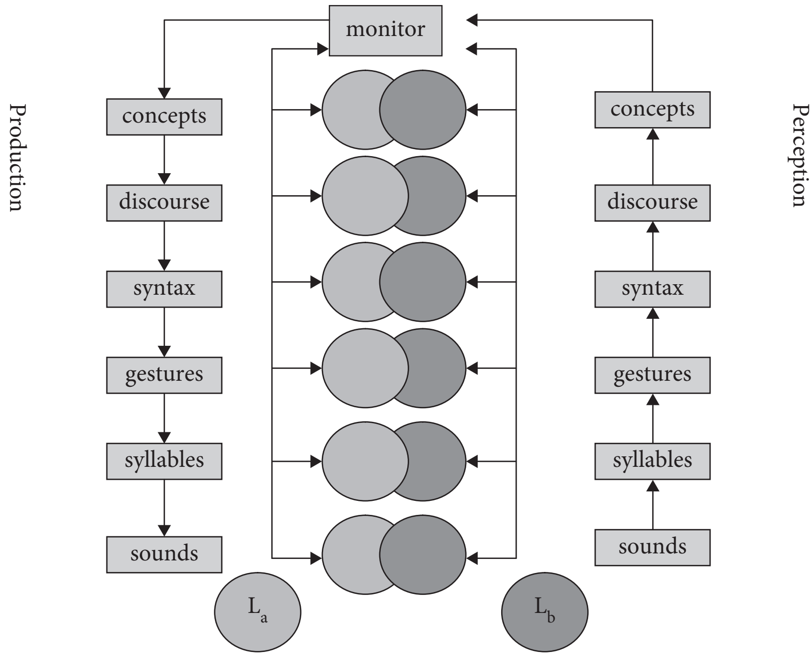
Production and perception

There are two types of links between production and perception. One is within the individual speaker who perceives her own speech through various types of feedback loops. The other is the impact of perceived speech (or text) produced by others. In our description of the language system we assume that representations on the different levels are involved in processes of production and perception. So the activation of a syntactic structure or syllable from L_a in preparation of speech, or perceiving it in the speech of interlocutors may both have an effect on level of activation of subsets. In the Levelt model only the lexicon seems to be involved in processes of production and perception, but there is likely to be a link between production and perception which may be relevant here.

There is a large set of data on cross-modal priming and the effects of visual priming on language production, in particular various naming tasks (e.g. Hermans et al. 1998). This research shows a clear link between modalities and between production and perception, and between languages. Here the main point is whether the language used by other interlocutors has an impact on patterns of CS by a speaker. Experimental research on the impact of the language and CS patterns used by interlocutors is only beginning to emerge (see Kootstra et al., this volume). Broersma et al. (this volume) presents some preliminary results of the impact of the language used by the interviewer in a corpus on English/Russian CS.

States of activation

The independence but also relatedness of different components in the production system allows for all sorts of switching, like the use of a syntactic frame from language A with words from language B, which are then pronounced like a word from language A, or C. In other words, there are many possible states the system can be in, with each level being dominated by one language or another, without that dominance necessarily flowing to other levels. Figures 2 and 3 present two of the possible states the language system of a CSer can be in. In these figures the language production and perception systems are represented in a simplified way by mentioning the different components in the Levelt model discussed earlier. The circles in different shades signal both the partial overlap between languages in the different components and possible patterns of dominance in these components. An overlapping circle at a given level indicates that the corresponding language is the dominant one that has access to the output systems.



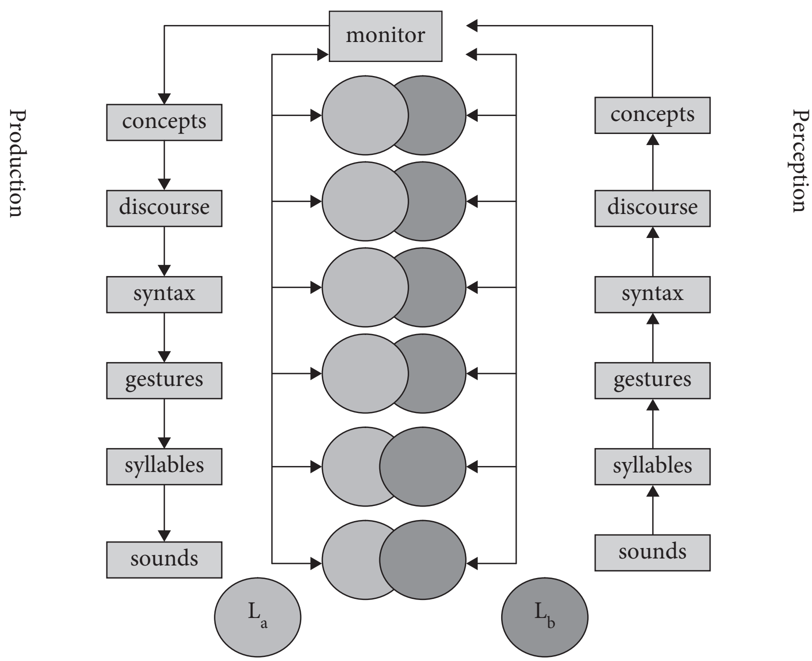


Figure 2 and 3. Possible states of the language system

The intention to use a specific language is specified by the monitor, but the actual outcome at each level is dependent on availability of activated elements. Elements that are shared by languages might be more easily retrieved than language specific elements. Equivalence in that sense is not a constraint, but the result of a make-do or least-effort selection process. In our view the different states the language system can be in can explain the wide variety of code switching patterns in multilinguals, ranging from only words pronounced according to the rules of one language, while at all other levels the rules of the other language seem to apply, to a complete shift to the other language at all levels and all possible combinations between these two extremes.

Concluding remarks

In this contribution, we have tried to show that the mechanisms that play a role in the incidence of CS should be distinguished from those that cause actual switches. In habitual switchers, the activation levels of the two languages are both high and only a small change or trigger is needed to make the language system switch from output in one language to output in another language. Self-Organized Criticality, a concept taken from theories on change in complex adaptive systems, seems to offer a perspective to better understand code switching and triggering. From this perspective, languages in a CS setting are constantly in a critical state, which means that they can easily switch state. A switch of state here means a switch to another language. In such a critical state, a minor incident may lead to a state change or switch. Which incident causes the switch and what form the switch will take cannot be predicted. The analogy used is the one of a grain of sand that can cause an unpredictable avalanche in a pile of sand. It is argued that in the multilingual system there can be switches between languages at different levels. In different subsystems different languages can be dominant and minor effects can lead to a change in dominance at each of these levels. Language specific subsets at different levels are also interconnected so that a change of dominance at one level can affect the balance at another level. To what extent a trigger leads to a switch at one or several levels cannot be predicted. Overlap of representations can lead to triggering: when an element from language A is activated that has a similar representation in another language, the activation of the shared element may lead to a higher activation of the other language and so trigger a switch to language B. Representations can be shared at all levels where there is storage: the conceptual level, the syntactical level, the discourse level, the gesture level, the syllable level and the phoneme level. It follows that more triggering will take place with languages that share more overlap in representations, which typically is the case for languages that are typologically similar. Future research should be aimed at showing the triggering effect of overlap at all those levels. There is now some evidence for the lexical level, but that needs to be extended to the other levels in order to validate the assumptions presented here.

One of the consequences of the approach presented here is that occasional code switching and borrowing are fundamentally different from habitual code switching as the Russian data in Broersma et al. (this volume) show. In the habitual switcher, the two languages are both highly activated, which leads to a critical state in which it is difficult to predict what happens. For the occasional switcher, more simple mechanisms such as lack of knowledge or low availability may suffice to describe patterns of CS.

We do not pretend to have a new model of language production or CS: the model presented reflects just another way of looking at language production in multilinguals. Research on CS and triggering may provide us with information about multilingual processing in much the same way as experimental research using priming and translation tasks have done, with the additional advantage that the ecological validity of spontaneous speech data is higher and shows the messiness and variation that is typical of normal language production.

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CHAPTER 5

Triggered code switching

Evidence from Dutch – English and Russian – English bilinguals

Mirjam Broersma, Ludmila Isurin, Sybrine Bultena, and Kees de Bot
Radboud University Nijmegen/ Ohio State University/Radboud University Nijmegen/ University of Groningen

This paper presents further evidence that cognates may facilitate code switching. In three corpora of natural speech, code switches occur more often directly following or in the same clause as a cognate (or 'trigger word') than elsewhere. Triggered code switching is found between typologically similar languages, with Dutch L1 – English L2 speakers in New Zealand and Australia, and between typologically distant languages, with a Russian L1 – English L2 speaker in the USA. We find that words following but not words preceding a trigger word have an increased chance of being code switched, that form overlap without meaning overlap may be sufficient for triggering to take place, and that the attachment of extensive Russian morphology to a trigger word stem does not diminish its triggering potential. We do not find an effect of the interlocutor's use of trigger words. Further, discourse connectors are often used in the vicinity of code switches.

Keywords: code switching, cross-linguistic comparison, triggering, psycholinguistics

Introduction

In the mind of the multilingual, words, syntactic structures, phonology, and gestures from at least two languages wait for a chance to be produced. They all have their own language specific form and can be produced in perfectly monolingual utterances, but more interestingly, they can also be mixed in all possible combinations. Russian words can be produced with an English word order, English words can be embedded in Russian morphology, and these morphemes might in turn be pronounced with an English–like phonology. There is no guarantee that a language choice on one of these levels is paralleled with a similar choice at another level. However, there is no guarantee either that a language choice on one level might not influence choices at other levels.

In De Bot et al. (this volume), we argue that when it comes to code switching, the language system of a bilingual in a code switching setting might be like a pile of sand. When more sand drips onto the pile, at some point the sand will start shifting and smaller or larger avalanches will take place. When and where the avalanches will occur and how many and how big they will be is unpredictable. Also, it is impossible to point to a single grain of sand and say that it 'caused' the avalanche, but still its contribution might have been crucial – just like that of all the other grains of sand. Likewise, a minor change in the language system may lead to a major shift, i.e., a change in the output language.

We assume that the different levels of speech might interact, and a shift from one language to another on one level (say, the word level) might stimulate a shift towards that language on other levels (e.g., syntax and phonology) as well, but again, this might be a matter of likelihood and by no means a rule. Similarly, of course, a shift on one level might have a continuing influence at that same level: when Russian becomes the 'selected' language at the syntactic level, it may stay selected for a while. This becomes interesting in those cases where the shift was an 'accidental' one. For example, if two languages share a certain syntactic construction, the use of that construction might stimulate a shift from one language towards the other language, even if the construction was not produced in that other language. Thus, the similarity between the two languages might in this case *trigger* a code switch.

In this paper, we investigate how a shift in language dominance on one level influences the next language choice *at the same level*. We focus on the lexical level, and we assess several issues that are important there: which words are likely to be code switched under the influence of a trigger, what is the role of word meaning and word form in triggering a code switch, what is the role of morphological complexity, can hearing a trigger word spoken by an interlocutor also trigger code switches, and can repetitive discourse elements trigger code switches?

In order to address these different questions, we look at different combinations of languages. First, we discuss code switching between two typologically similar languages, namely Dutch and English. We present data from two corpora of bilingual speech, with Dutch L1 – English L2 speakers living in New Zealand and Australia. Next, we discuss code switching between two typologically distant languages, with data from a Russian L1 – English L2 speaker living in the USA. The data from these different combinations of languages provide us with several new insights into triggered code switching. We apply statistical tests to natural speech data, an approach that combines the benefits of naturalness with those of generalizability.

Of course, there are different reasons for people to code switch or not to code switch. The situation we are interested in here is one in which speakers feel free to code switch, and in which a small trigger might be enough to tip the balance, or rather, to make the sand slide and cause an avalanche.

Triggered code switching at the lexical level

So far, the existence of triggered code switching has only been established at the lexical level. In the 1960s, Michael Clyne already observed that code switches seemed to occur relatively often in the neighborhood of a cognate (Clyne, 1967). He proposed that cognates might *trigger* a switch from one language to another (Clyne, 1967, 2003). We elaborated on this idea and tested it in a corpus of natural, self-recorded Moroccan Arabic – Dutch speech (Broersma & De Bot, 2006). The results of statistical testing showed that, indeed, code switches occurred more often when a cognate was present. We found that 1) words that immediately followed a cognate were switched more often, and 2) in addition to that, words that did not directly follow a cognate but were part of the same basic clause as the cognate were also code switched more often than was the case in the absence of a cognate.

Our explanation is that the selection of a cognate leads to an increased activity of the 'other' language at the lexical level. As cognates are very similar in two languages, they are likely to be strongly connected at the lexical level. Thus, when a bilingual speaks Dutch, selection of a cognate might lead to an increased activation of Moroccan Arabic and vice versa, which might enhance the occurrence of code switching.

Dutch and Moroccan Arabic are typologically dissimilar and do not share many cognates. In the corpus, all cognates were nouns, many of them proper nouns. The proportion of cognates was relatively low, namely 5% (104 cognates on a total of 2224 words). It is possible that for such dissimilar languages, with so few cognates, the impact of a cognate is much larger than for languages that overlap in many ways. Therefore, we would like to investigate whether for languages that are typologically similar and share many cognates, these cognates also induce code switching. To this end, we selected two languages that are lexically strongly related: Dutch and English. In the two corpora collected among Dutch – English bilinguals in New Zealand and Australia, described below, 68% and 64% of all words were cognates (9336 and 5956 cognates on a total of 13648 and 9344 words, respectively), and cognates occurred in all grammatical classes.

Further, we wanted to investigate which words exactly can trigger a code switch. In Broersma and De Bot (2006), trigger words were defined as cognates, sharing both word form and word meaning across languages, allowing for small differences in phonological form. In the present paper, we investigate the role of meaning and form overlap in triggered code switching. Is word form overlap enough to trigger a code switch, or is word meaning overlap an essential requirement? Thus, do false friends trigger code switches in the same way as cognates do? The Moroccan Arabic – Dutch data used in Broersma and De Bot (2006) did not contain any words that overlapped in form but not in meaning. As Dutch and English share so many cognates, it turned out to be impossible to investigate this question with this language pair, as the data simply do not provide enough non-cognates to separate the role of form and meaning. Therefore, we turn to another pair of typologically dissimilar languages that do share enough false friends to investigate the role of form and meaning overlap separately: Russian and English. In this data set, 3% of all words were trigger words (86 trigger words on a total of 2896 words).

Elaborating on the question which words can trigger a code switch, we also investigate how transparent a cognate needs to be in order to function as a trigger. As Russian is a morphologically complex language with an extensive system of prefixation and suffixation, cognates are in many cases not easily recognizable as such. Cognate stems are often embedded in morphological structure, as in the example of *za-gaz-ovannom*, containing the cognate *gaz*. The question then becomes whether such morphologically masked cognates can still trigger a code switch.

Further exploring the Russian – English corpus, we investigate whether trigger words uttered by one speaker can induce code switching by another speaker. Finally, we address the use of discourse connectors that do not overlap in form and meaning in the two languages, but that have similar patterns of use in both languages. Are such discourse connectors related to code switching, and if so, are they cause or effect of the code switching?

Dutch – English data from New Zealand

Materials

First, we investigated the effect of cognates on code switching in typologically similar languages with strong lexical overlap. The materials used here were collected in a study into language loss among Dutch immigrants in New Zealand (Hulsen, 2000). Six interviews with Dutch – English bilinguals that seemed to contain a substantial amount of code switching were considered for analysis. After

Table 1. The informants (AoA: age of arrival in New Zealand; Length of residence: in New Zealand)

Informant #	Gender	Age	AoA	Length of residence	Interview duration (min.)	Clauses with CS (%)
1	F	73	39	34	24	35
2	F	59	12	47	20	17
3	M	67	21	46	27	16
4	M	69	29	40	13	26

transcription, the four interviews with the largest number of code switches were selected. They contained between 36 and 138 code switched words (on a total of 1248 to 3417 words), and between 34 and 106 clauses containing a code switch (on a total of 132 to 412 clauses), with a proportion of clauses containing a code switch between 16 and 35%. (For the two excluded interviews, these values were all smaller: 8 and 25, 7 and 28, and 4 and 15% respectively.)

The informants, two male and two female speakers, were between 59 and 73 years old at the time of the interview. They had moved from the Netherlands to New Zealand when they were between 12 and 39 years old, and had been living there between 34 and 47 years (Table 1).

During the interview, informants were asked about their experiences around their immigration, their life in New Zealand, visits to the Netherlands, and their use of and attitude towards the use of Dutch and English. Interviews were carried out in the informants' homes. The interviewer was a Dutch female, and whereas the respondents were aware that she knew English well, she spoke only Dutch during the interview. The interviewer's contribution to the conversations was limited to questions and short responses, and intended to elicit spontaneous, running speech from the informants. Only the informants' speech is examined here.

Method

Two main questions were addressed. First, are words directly following a trigger word code switched more often than other words? Second, are words that do not directly follow a trigger word but that are part of the same basic clause as the trigger word also code switched more often than other words? In Broersma and De Bot (2006), positive evidence was found for both questions. The former approach, based on the word order of the utterance, stays close to Clyne's original view on triggered code switching (Clyne, 1967, 2003), the latter, based on the clause level, stems from Broersma and De Bot's (2006) elaboration of triggered code switching. These two main questions were assessed as follows.

First, each word spoken by each informant was coded as a trigger word or a non-trigger word. Words were considered trigger words when they overlapped both in form and meaning across the two languages, allowing for some differences in the two languages. Trigger words thus comprised cognates and proper nouns. As lexical activation concerns the activation of lemmas, not lexemes (e.g., Levelt, 1989), whether a word was a trigger word was also determined on the basis of its lemma form. E.g., all forms of the verbs 'to go' / '*gaan*' were considered trigger words, including the partially overlapping lexemes 'go' / '*ga*' and the entirely non-overlapping lexemes 'went' / '*ging*'. Trigger words comprised translation equivalents that are fully homophonous with identical IPA notations, forms that are phonetically very close, and forms that are not homophonous in citation form, but very similar in running speech and in the informant's pronunciation.

One judge (the first author of this paper) coded each word as a trigger word or a non-trigger word. Statistical analyses were based on this judge's coding. As the definition of trigger words entails a certain degree of subjectivity, in order to assess the reliability of this first judge's coding, five other judges coded a subset of 21% of the data, deciding independently from one another for each word in the subset whether they considered it as a trigger word or not. All six judges were native speakers of Dutch who were proficient in English as a second language. The inter-rater reliability (calculated with a Two-Way Random Effects Model, Type Absolute Agreement, Average Measures Interclass Correlation Coefficient) was high (ICC =.914, p <.001), showing that there was strong agreement among all six judges. The correlation between the first judge's coding and each of the five other judges was also high (averaged Pearson r (2552) =.6248, p < 0.01). These results warrant the analyses based on the first judge's classification of trigger words and non-trigger words.

Next, for the word level analysis, the language of each word was established in a linear fashion. If a word differed in language from the preceding one, it was considered to be code switched. Note that trigger words are never counted as a code switch. Arguably, this leads to an underestimation of the amount of code switching. Such a rigorous categorization, however, is crucial for the current study, as it makes the statistical testing of the triggering theory possible. In the following examples, Dutch words are in italics, English words in non-italics, and trigger words in bold. For the intelligibility of the examples, trigger words are also spelled and italicized as if they are either Dutch or English; however, this is for clarity only and is not meant to suggest the trigger words actually belong to that language. Note also that the Dutch and English spelling of trigger words may differ considerably (e.g., 'you' / '*je*'), without indicating poor overlap in phonological form.

In the word level analysis, example 1 contains two code switched words ('chemist' and '*vroeg*'), both following a trigger word, and example 2 contains six code switched words ('still', '*mensen*', 'still', '*gordijnen*', 'still', and '*nog*'), all following and sometimes also preceding a trigger word.

(1) Informant # 4:
Engels is zo **widely** understood **in Holland** / ***dat als je*** *zelfs naar* ***een*** *winkel* ***ging***, *naar naar* ***een*** chemist shop ***of zoiets*** / ***en je*** *vroeg naar iets* / ***en het was in een beetje gebroken Hollands*** / ***dan*** *negen van* ***de tien*** *keer* ***het*** *winkelmeisje antwoordde* ***je*** *terug* ***in het Engels***.
[English is so widely understood in Holland that even if you went to a shop, to to a chemist shop or so, and you asked for something and it was a bit in broken Dutch, then nine out of ten times the salesgirl answered you back in English.]

(2) Informant # 3:
En dat vond ik het *leukst* / *om weer terug* ***te gaan*** / ***dat al die karakteristieken, die typische Hollandse karakteristieken*** **are** still there. ***De*** *mensen,* still ***de open*** *gordijnen,* ***en*** still **the** same / **what I** would call very ***typische Hollandse dingen*** / ***die zijn er*** *nog.*
[And that I liked best about going back, that all those characteristics, those typical Dutch characteristics are still there. The people, still the open curtains, and still the same what I would call very typical Dutch things, they are still there.]

Thus, a word was considered to be code switched when it was part of a different language than the previous non-trigger word. Note that, due to the high proportion of trigger words, the previous non-trigger word may be some words away. E.g., in example 1, '*vroeg*' is code switched relative to 'shop'. The four intervening words are all trigger words. Even the ones that have a clearly Dutch form might function as trigger words due to their overlap with English words, and therefore by definition they are not considered code switches here. Similarly, in example 2, '*nog*' is code switched relative to 'very', with six trigger words in between.

For the clause level analysis, the conversation was divided into basic clauses containing maximally one main verb. When a clause contained words from two languages, or from another language than the preceding clause, it was considered to contain a code switch. In the previous and in the following examples, basic clauses are indicated with a slash. In the clause level analysis, example 3 contains one code switch from the first to the second basic clause.

(3) Informant # 4:
Want ***er waren families hier*** / ***die dat deden*** on purpose.
[Because there were families here who did that on purpose.]

Example 4 contains two code switches, from the first to the second basic clause, and from the second to the fifth basic clause.

(4) Informant # 1:
En dan *praat* ***je Nederlands*** / because ***dat is*** much **more** / ***wat het was*** / ***niet wat het is*** / *maar* ***wat het was****.*
[And then you speak Dutch, because that is much more what it was, not what it is, but what it was.]

Example 5 contains a code switch within the second basic clause.

(5) Informant # 2:
Wij spreken soms Nederlands*, maar* ***niet*** *vaak. / Maar* ***emotioneel voor mij is het heel*** important.
[We sometimes speak Dutch, but not often. But emotionally for me it is very important.]

Example 6 contains code switches within the first and sixth basic clause.

(6) Informant # 3:
Maar anyway, **I could / I could / fill your whole tape** with **the** with **the passport question /** because **it it's a** very very **deep** issue / which **is totally** / which **is** *onbegrijpelijk / want* ***andere landen staan de dubbele nationaliteit toe****.*
[But anyway, I could I could fill your whole tape with the with the passport question because it it's a very very deep issue which is totally which is incomprehensible, because other countries allow the double nationality.]

The relationship between trigger words and code switches was investigated with two statistical tests, the χ^2 test for independence and Fisher's Exact test. Both tests assess whether two variables are independent of each other. Fisher's Exact test is more accurate than the χ^2 test if one of the cells contains a small value, or if the marginal is very uneven. The probabilities from both tests are reported as p for the χ^2 test and P for Fisher's Exact test.

Results

First, for the word level analysis, it was investigated whether words that followed a trigger word were code switched more often than words that did not border on a trigger word. Indeed, words that followed a trigger word were code switched 15.7% of the time, whereas words that did not border on a trigger word were code switched only 7.2% of the time (Table 2). This difference was statistically significant ($\chi^2 = 11.40$, $p < 0.001$, $P < 0.001$).

Table 2. Number of words that are code switched, number of words that are not code switched, and percentage of words that are code switched, split by words that follow a trigger word and words that do not border on a trigger word

Following a trigger word	**Code switch**		
	Yes	**No**	**% Yes**
Yes	82	439	15.7
No	19	245	7.2

Next, it was investigated whether words directly preceding a trigger word were also code switched more often than words that did not border on a trigger word. This was not the case, as Table 3 shows ($\chi^2 < 1$, $P > 0.2$). Similarly, for words that followed a trigger word, the chance of being code switched did not further increase when they also preceded a trigger word (Table 4; $\chi^2 = 0.00$, $P > 0.5$). Thus, for the word level analysis, trigger words only influenced the words directly following them, such that those words were code switched more often than the other words.

Table 3. Number of words that are code switched, number of words that are not code switched, and percentage of words that are code switched, split by words that precede a trigger word and words that do not border on a trigger word

Preceding a trigger word	**Code switch**		
	Yes	**No**	**% Yes**
Yes	48	470	9.3
No	19	245	7.2

Table 4. Number of words that are code switched, number of words that are not code switched, and percentage of words that are code switched, split by words that border on a trigger word on two sides and words that only follow a trigger word

Bordering on a trigger word on:	**Code switch**		
	Yes	**No**	**% Yes**
Two sides	166	889	15.7
One side (only following it)	82	439	15.7

At the clause level, basic clauses with a trigger word contained a code switch 23.2% of the time, while other clauses contained a code switch only 11.4% of the time (Table 5). This difference was significant ($\chi^2 = 5.2$, $p < 0.05$, $P < 0.05$).

Table 5. Number of basic clauses containing a code switch, number of basic clauses not containing a code switch, and percentage of basic clauses containing a code switch, split by basic clauses containing a trigger word and basic clauses not containing a trigger word

Trigger word	Code switch		
	Yes	No	% Yes
Yes	253	838	23.2
No	8	62	11.4

Similarly to the results of Broersma and De Bot (2006), the present results show that 1) words that immediately followed a cognate were code switched more often, and 2) words that were part of the same basic clause as the cognate were also code switched more often than was the case in the absence of a cognate. Thus, the influence of trigger words on code switching is not restricted to typologically distinct languages. Even for language pairs that share a very large number of cognates, these cognates exert a strong influence on other words and enhance the occurrence of code switching.

Dutch – English data from Australia

In order to further support the findings from the Dutch – English data collected in New Zealand, we endeavored to replicate the results with data from Dutch – English bilingual speakers in Australia.

Materials

The materials consisted of two interviews with Dutch – English bilinguals. They were Dutch immigrants, both females, who were 81 and 76 years old and had been living in Australia for 35 and 54 years respectively at the time of interview (Table 6). They were interviewed as part of a project on long term language attrition, and had previously been tested in 1971 and 1987 using the same procedures (De Bot & Clyne, 1994). The interviews contained 78 and 139 clauses with a code switch (on a total of 487 and 808 clauses), with a proportion of clauses containing a code switch of 16% and 17% respectively.

The interviews were carried out in a similar way as those described in Section 3, with the exceptions that the interviewer was an Australian native speaker of English who spoke Dutch well, and that in addition to answering questions about their immigration, life in Australia, and their language use, the informants were also asked to describe one photograph in Dutch and one in English. The interviewer used only Dutch during the interview (as in Section 3), except when the informant was asked to describe a photograph in English.

Table 6. The informants (AoA: age of arrival in Australia; Length of residence: in Australia)

Informant #	Gender	Age	AoA	Length of residence	Interview duration (min.)	Clauses with CS (%)
1	F	81	46	35	32	12
2	F	76	22	54	46	14

Method

The data were analyzed as in the previous section. Here, however, only analyses at the clause level were performed. We expect to provide more extensive data from this population in the near future.

Results

Clauses with a trigger word contained a code switch 17.0% of the time, and clauses without a trigger word never did. Correcting for the zero in one cell (Table 7), the difference was found to be significant ($\chi^2 = 5.94$, $p < 0.05$, $P = 0.05$).

Table 7. Number of basic clauses containing a code switch, number of basic clauses not containing a code switch, and percentage of basic clauses containing a code switch, split by basic clauses containing a trigger word and basic clauses not containing a trigger word

Trigger word	Code switch		
	Yes	No	% Yes
Yes	217	1062	17.0
No	0	16	0.0

Russian – English data from the United States

With the Dutch–English data, we have shown that cognates can trigger code switches, not only for typologically distinct languages but also for related languages with strong lexical overlap (i.e., sharing many cognates).

In this section, we turn to a typologically distinct language pair again. Russian and English represent linguistically and typologically distant families: Slavic and Germanic. Moreover, Russian is a language typologically distant both from English and Dutch. It shares fewer cognates with English, and, as a result, the data in this study revealed fewer triggers than the Dutch – English data.

With the Russian – English data, we address the question which words can trigger a code switch. First, we try to replicate the results found with the Dutch – English data. Then, we assess whether false friends can act as triggers as well, and whether morphological embedding reduces a cognate's ability to trigger a code switch. Next, we investigate whether the use of trigger words by the interlocutor can trigger code switching in the informant's speech, and we investigate the relation between discourse connectors and code switching.

Materials

The materials consisted of a conversation with one Russian English bilingual speaker. The informant was a 35 years old female who had moved from Kiev, Ukraine, where she was born and raised, to the United States when she was 21 years old and had resided there for 14 years at the time of the interview. Code switches occurred in 18% (110 out of a total of 613) of the informant's basic clauses.

The conversation was carried out largely similar as those described in Sections 3.1 and 4.1. It consisted, however, of free conversation without pre-determined topics. The conversation took place in the informant's home. The interviewer (the second author of this paper) was a female native speaker of Russian with a good command of English, whom the informant knew well. Although the informant was aware that the interviewer spoke both Russian and English well, the interviewer spoke only Russian throughout the interview. Further, the interviewer spoke as little as possible without corroding the naturalness of the conversation. The conversation lasted for 45 minutes and elicited 2896 words from the informant.

The informant was raised in a Russian–speaking family and had attended a Russian school. At the time, Kiev was predominantly Russian–speaking. She reported that currently English was her dominant language, both at home and at work. She considered herself a habitual code switcher, as she very frequently switched between Russian and English when speaking to Russian – English interlocutors. Below is a sample of the informant's code switching registered in the present data. In the following examples, Russian words are in italics, English words in non-italics, and trigger words in bold.

(7) *A ja perezhivaju, potomu chto* **South America** it's so deep, maybe you need some shots, like for malaria. So *ja nemnozhko perezhivaju*.
[I worry because South America it's so deep, maybe you need some shots, like for malaria. So I worry a bit.]

Method

The data was coded and analyzed as in the previous sections. All words were categorized as trigger words or non-trigger words. In the word level analysis, for non-trigger words it was determined whether they immediately preceded or followed a trigger word. All non-trigger words were coded as code switched or not. In the following example, 'American', 'Ukrainian', 'passport' and 'Dominican Republic' are trigger words.

(8) No, he is an **American** citizen, which is going there weird, *potomu chto* I have to bring my **Ukrainian passport** *so mnoj, kogda my edem tuda v* **Dominican Republic**.
[No, he is an American citizen, which is going there weird, because I have to bring my Ukrainian passport with me when we go there, to the Dominican Republic.]

For the clause level analysis, each conversational sample was divided into basic clauses and each basic clause was then analyzed for the presence of trigger words and code switches. Example 9 illustrates how clauses were identified:

(9) And they go through **Italy** / and they went through such hard times / *kogda oni cherez* ***Italiju*** *ehali* / and had such a horrible time / to adjust here.
[And they go through Italy, and they went through such hard times when they go through Italy and had such a horrible time to adjust here.]

In the above example, the trigger word 'Italy' occurs twice, first in its English variant and second in Russian. The utterance begins in English, and is continued in Russian in the third basic clause. This basic clause is thus code switched compared to the previous basic clause, and also contains a trigger word, namely the word 'Italy' in its Russian variant.

Results

Cognates

Most of the trigger words in the present data were nouns. There were 86 trigger words on a total of 2896 words (3%). Note that this is less than for the Moroccan Arabic – Dutch data (Broersma & De Bot, 2006), where 5% of the words were trigger words.

The Moroccan Arabic – Dutch data as well as the Dutch – English data in Section 3 of this paper show that words directly following a trigger word are more likely to be code switched than other words. The analysis of the Russian – English data showed similar results. Words directly following a trigger word were code switched 28.4% of the time, and other words only 9.5% of the time (Table 8). This difference was statistically significant ($\chi^2 = 54.2$, $p < 0.001$, $P < 0.001$).

Table 8. Number of words that are code switched, number of words that are not code switched, and percentage of words that are code switched, split by words that follow a trigger word and words that do not border on a trigger word

Following a trigger word	Code switch		
	Yes	No	% Yes
Yes	44	111	28.4
No	226	2146	9.5

Table 9. Number of words that are code switched, number of words that are not code switched, and percentage of words that are code switched, split by words that precede a trigger word and words that do not border on a trigger word

Preceding a trigger word	Code switch		
	Yes	No	% Yes
Yes	18	137	11.6
No	226	2146	9.5

Words preceding a trigger word were not code switched more often than words that did not border on a trigger word (Table 9, $\chi^2 < 1$, $P > 0.2$), nor was the chance of being code switched for words that followed a trigger word higher when they also preceded a trigger word (Table 10, $\chi^2 < 1$, $P > 0.4$).

Table 10. Number of words that are code switched, number of words that are not code switched, and percentage of words that are code switched, split by words that border on a trigger word on two sides and words that only follow a trigger word

Bordering on a trigger word on:	Code switch		
	Yes	No	% Yes
Two sides	2	8	20.0
One side (only following it)	44	111	28.4

At the clause level, basic clauses containing a trigger word contained a code switch 31.0% of the time, and other clauses only 13.9% of the time (Table 11). This effect of trigger words was statistically significant ($\chi^2 = 22.10$, $p < 0.001$, $P < 0.001$).

Table 11. Number of basic clauses containing a code switch, number of basic clauses not containing a code switch, and percentage of basic clauses containing a code switch, split by basic clauses containing a trigger word and basic clauses not containing a trigger word

Trigger word	Code switch		
	Yes	No	% Yes
Yes	45	100	31.0
No	65	403	13.9

Thus, the present data provide additional support to the findings from the Dutch – English data described above, as well as the Moroccan Arabic – Dutch data from Broersma and De Bot (2006). Code switches into another language are more likely to occur right after a trigger word, and basic clauses containing a trigger word are also more likely to contain a code switch.

Form and meaning overlap

The above analyses were based on triggers that were cognates, i.e., words that overlapped semantically and phonologically in two languages. Next we investigated whether word form overlap alone is enough to induce a code switch. The present set of data revealed numerous cases of false friends. False friends are words that overlap in their phonological form but differ in meaning in two languages. Costa et al. (2006) suggest that the only way in which false friends can be activated in the non-target language is through activation of the phonological form of the word in the target language that sends activation to the lexical form of the corresponding homophone in the non-target language. According to this argument, we might expect the Russian word *god* ('year') to activate the corresponding homophone 'god' in English and act as a trigger in activating the non-target language and subsequently inducing a switch into English. Some examples of false friends identified in the present data are given in Table 12.

Table 12. False friends

Word form in English / Russian	Meaning of the Russian word
dome / *dom*	house
family / *familia*	last name
god	year
hotel	wanted (3rd person masculine, past tense)
let	years (Genitive case)
on	he (Nominative case)
quarter / kvartira	apartment

Table 13. Number of words that are code switched, number of words that are not code switched, and percentage of words that are code switched, split by words that follow a false friend and words that do not border on a false friend or on a trigger word

Following a false friend	Code switch		
	Yes	No	% Yes
Yes	11	40	21.6
No	204	2016	9.2

In order to be able to assess the effect of false friends, words that bordered on a trigger word were removed from the analysis. Words directly preceding a false friend were not code switched more often than words that did not border on a false friend ($\chi^2 < 1$, $P > 0.3$).

As Table 13 shows, words directly following a false friend were code switched 21.6% of the time, and words that did not border on a false friend only 9.2% of the time. This difference was statistically significant ($\chi^2 = 8.91$, $p < 0.01$, $P < 0.01$). Thus, similarly to the trigger words, false friends did not affect code switching of the preceding words, but did lead to a higher chance of code switching of the following words. The words that followed a false friend (Table 13) were compared to the words that followed a trigger word (Table 8). There was no statistically significant difference in the percentage of code switching of these items ($\chi^2 < 1$, $P > 0.2$).

Thus, the results showed that false friends also triggered code switching, which suggests that word meaning overlap may not be necessary and word form overlap alone may be sufficient for triggering a code switch.

Morphological masking

Now that we have established that form overlap plays an important role in enhancing code switching, we turn to the question how much form overlap is needed, and specifically what the role of morphological complexity is. To what extent can bound morphemes mask a cognate that they are attached to and hinder its triggering potential? The morphological structure of Russian is very rich and provides the main source of word formation in the language. While there are cognates with an almost complete overlap in meaning and form, like '*transport*', '*America*', and '*mama*', some show only a partial resemblance with the form of their English counterparts due to prefixation and suffixation, e.g. '*tematicheskij*' where only the stem '*tema*' ('theme') retains its original form.

To investigate whether morphological complexity influences triggering, trigger words that were produced as Russian words were divided into three categories based on their morphological form: transparent, less transparent, and masked trigger words. The first category includes cognates with a zero ending or only one inflectional morpheme (e.g., '*moment*', '*Kieve*', '*sestra*', '*mamu*'). The second includes cognates with a derivational suffix and words with both a derivational suffix and an inflectional morpheme (e.g., '*nacionalistka*', '*radikalno*', '*practicheski*'). The third includes words with both suffixes and prefixes, where only the stem retains the original meaning while Russian morphemes on both sides make it hard to recognize the word as an original borrowing from English (e.g., '*po-angliiski*'), and morphological blends (e.g., '*proftehshkola*'). An illustration of some of the trigger words found in the data and their classification are given in Table 14.

There were 77 instances of trigger words articulated in Russian. The majority (57) came from the first category (transparent), while the second category (less transparent) accounted for 15 trigger words, and the third (masked) for 5 trigger words.

Words that preceded a trigger word did not have an increased chance of being code switched for any of the three categories (transparent triggers: $\chi^2 < 1$, $P > 0.2$; less transparent triggers: $\chi^2 = 1.58$, $p > 0.2$, $P > 0.2$; masked triggers: $\chi^2 < 1$, $P > 0.3$).

The results for the words following a trigger word in each of the three categories are shown in Tables 15, 16, and 17. Words that did not follow a trigger word were code switched 9.5% of the time, words that followed a transparent trigger 17.5%, words that followed a less transparent trigger 20.0%, and words that followed a masked trigger 40.0% of the time. Comparisons of the three categories of triggers did not reveal any statistically significant differences (transparent versus less transparent triggers: $\chi^2 < 1$, $P > 0.5$; less transparent versus masked triggers: $\chi^2 < 1$, $P > 0.4$; transparent versus masked triggers: $\chi^2 = 1.5$, $p > 0.2$, $P > 0.2$). Thus, triggered code switching occurred regardless of the amount of morphological embedding.

Table 14. Morphological classification of Russian triggers

Transparent	Less transparent	Masked
dezajner ('designer')	adaptirovalas ('adapted')	po-angliiski ('in English')
institute	blondinka ('blond')	po-russki ('in Russian')
Kieve ('Kiev')	dochka ('daughter')	proftehshkola ('professional technical school')
lingvist ('linguist')	doktorskuju ('doctor')	
mama	immigracija ('immigration')	
moment	konstruktorom ('construct')	
professoru ('professor')	nacionalistka ('nationalist')	
sestra ('sister')	practicheski ('practically')	
syn ('son')	radikalno ('radically')	
	tehnicheskoje ('technical')	

Splitting the trigger words into three categories considerably reduced the statistical power of the analyses. Indeed, the triggering effect did not reach significance for all categories of trigger words separately. For transparent triggers, the effect was significant ($\chi^2 = 4.1$, $p < 0.05$, $P < 0.05$), for less transparent triggers it was not ($\chi^2 = 1.9$, $p > 0.1$, $P > 0.1$), while for masked triggers, χ^2 yielded a significant result whereas Fisher's Exact Test just missed significance ($\chi^2 = 5.3$, $p < 0.02$, $P = 0.075$).

The finding that there were no statistically significant differences between the three categories of trigger words suggests that morphological embedding does not reduce the triggering capacity of a cognate. As even the combination of Russian prefixes and suffixes of the masked trigger words did not reduce the trigger words' power to trigger code switching, it seems that triggering is caused by the stem of the trigger word, regardless of its morphological structure.

Table 15. Number of words that are code switched, number of words that are not code switched, and percentage of words that are code switched, split by words that follow a transparent trigger word and words that do not border on a trigger word

Transparent trigger word	Code switch		
	Yes	No	% Yes
Yes	10	47	17.5
No	226	2146	9.5

Table 16. Number of words that are code switched, number of words that are not code switched, and percentage of words that are code switched, split by words that follow a less transparent trigger word and words that do not border on a trigger word

Less transparent trigger word	Code switch		
	Yes	No	% Yes
Yes	3	12	20.0
No	226	2146	9.5

Table 17. Number of words that are code switched, number of words that are not code switched, and percentage of words that are code switched, split by words that follow a masked trigger word and words that do not border on a trigger word

Masked trigger word	Code switch		
	Yes	No	% Yes
Yes	2	3	40.0
No	226	2146	9.5

Triggering between speakers

Recent studies on cross-linguistic priming show that what a speaker has just heard can affect his or her production (Hartsuiker, Pickering, & Veltkamp, 2004; Kootstra, Van Hell, & Dijkstra, this volume). If cross-linguistic priming is possible across the boundaries of perception and production, can we expect a triggering effect of the interlocutor's speech on the informant's speech?

So far we have analyzed the speaker's utterances without considering the possible effect of the interlocutor's utterances, as the latter were removed from the analysis. In the next analysis, the informant's speech is analyzed taking lexical triggers in the interviewer's speech into account. First, trigger words were identified in the interviewer's speech and next, code switches in the informant's speech after the interviewer's comments were identified. In order to identify a code switch, the language of the last basic clause in the informant's previous utterance was compared with the first basic clause in the informant's next utterance following the interviewer's turn. As mentioned before, the language of the interviewer remained the same, i.e., Russian. Consider the following discourse samples:

(10) Informant:
So I feel alone, *znaete, kogda moja mama uehala* and my father passed away.
[So I feel alone, you know, when my mom left and my father passed away.]
Interviewer:
Jeto vasha tetja kotoraja ***lingvist****?*
[Is this your aunt who is a linguist?]
Informant:
Jeto s moej mamy storony, ona s Ukrainy.
[This is from my mother's side, she is from Ukraine.]

(11) Informant:
Odin god.
[One year.]
Interviewer:
A ***photographia*** *u vas est'?*
[Do you have a photo?]
Informant:
No, not in this purse. He is very handsome, tall, dark.

In examples 10 and 11, the interviewer's comment contained a trigger word (*'lingvist'* and *'photographia'*) and the language of the informant changed from English to Russian in example 10 and from Russian to English in example 11.

Table 18. Number of basic clauses containing a code switch, number of basic clauses not containing a code switch, and percentage of basic clauses containing a code switch, split by basic clauses preceded by a perceived trigger word and basic clauses not preceded by a perceived or produced trigger word

Perceived trigger word	Code switch		
	Yes	No	% Yes
Yes	12	21	36.4
No	22	23	48.9

There were 88 utterances from the interviewer in the data and almost half of these contained a trigger word. In order to be able to assess the effect of the interviewer's speech, basic clauses that contained a trigger word in the informant's speech were removed from the analysis, leaving 78 basic clauses for analysis. As Table 18 shows, when the interviewer produced a trigger word, the informant produced a code switch 36.4% of the time, and when the interviewer did not produce a trigger word, the informant produced a code switch 48.9% of the time, which was not statistically different ($\chi^2 = 1.21$, $p > 0.2$, $P > 0.1$). Thus, there was no effect of the interviewer's use of trigger words on the informant's code switching behavior.

Note that overall, the percentage of code switches in Table 18 is relatively high compared to that in Table 11, namely 43.6% versus 17.9% (collapsing over both rows of each table). Table 11 represents all basic clauses uttered by the informant, and Table 18 only those that the informant uttered immediately after the interviewer had spoken. Thus, the informant code switched relatively often after the interviewer had spoken. This difference was statistically significant ($\chi^2 = 27.59$, $p < 0.001$, $P < 0.001$). As the interviewer always spoke Russian, we would expect the informant to switch from English to Russian more frequently than from Russian to English after the interviewer's utterances. Indeed, 20 of the informant's switches after the interviewer's utterances were from English to Russian and 14 were from Russian to English.

Repetitive discourse elements

So far, we have investigated the effect of a language shift due to the selection of trigger words that overlap in two languages in form and meaning, or in form only. However, it might also be possible that elements that do not overlap in either form or meaning may trigger code switches due to similarities in their patterns of use in the two languages. Here, we investigate whether there is a relation between the use of discourse elements and code switching. We propose that repetitive discourse elements are often used in the vicinity of code switches.

Thus, we are not looking for discourse elements that show semantic or phonological overlap in the two languages, but for frequently used patterns of discourse. The data revealed two such discourse connectors that were frequently used by the speaker: the phrase *vy znate* ('you know'), that was mostly used in its pro-drop version *znaete*, and a two-word conjunction *potomy chto* ('because'). The latter was mostly used as an intra-sentential connector, which legitimizes its classification as a discourse connector rather than a syntactic unit in the present analysis. The following examples illustrate the use of the two connectors (in bold print).

(12) *Ona zvonila, **znaete** kak, posylki tam, podarki*, and I grew up, ***znaete***, *jetot* Soviet Union fell apart and everything, you do not see any future over there, kind of scary and everything.
[She called, you know how it is, packages, gifts, and I grew up, you know, this Soviet Union fell apart and everything, you do not see any future over there, kind of scary and everything.]

(13) No, he is an American citizen, which is going there weird, ***potomu chto*** I have to bring my Ukrainian passport *so mnoj, kogda my edem tuda v* Dominican Republic.
[No, he is an American citizen, which is going there weird, because I have to bring my Ukrainian passport with me when we go there, to the Dominican Republic.]

(14) *Ja ego* renew ***potomu chto*** *u menja* Green Card and passport so I renewed it after a while. *No mne nado zanjat'sja uzhe* American citizenship, *pasport poluchit'*, ***potomu chto*** I am weary.
[I renewed it because I have a Green Card and passport so I renewed it after a while. But I need to take care of the American citizenship, to get a passport, because I am weary.]

Example 12 shows two instances of *znaete* ('you know'). The first occurs in the Russian fragment, and the second connects an English fragment with a Russian word. Examples 13 and 14 illustrate the use of *potomu chto* ('because'). In 13, the Russian connector is embedded in an English fragment. In 14, it is preceded by English and followed by Russian on its first occurrence, and vice versa on its second occurrence.

There were 30 instances of *vy znate* and 47 instances of *potomy chto* in the data. Note that in nine cases the discourse connector itself was code switched, as it was used in an English context. However, in order to investigate the discourse connectors' relation to code switching, we consider them as borrowings, and thus as belonging to both languages, and we assess whether the words immediately before and after the discourse connector differ from each other in language. All cases where a trigger word might have played a role were excluded from the analyses.

Words preceding a discourse connector did not have an increased chance of being code switched ($\chi^2 < 1$, $P > 0.4$). Table 19 shows the results for the words following a discourse connector. Those words were code switched 38.5% of the time, while words that did not follow a discourse connector were code switched only 9.9% of the time. This difference was statistically significant ($\chi^2 = 54.2$, $p < 0.001$, $P < 0.001$).

Table 19. Number of words that are code switched, number of words that are not code switched, and percentage of words that are code switched, split by words that follow the discourse connectors 'vy znate' or 'potomy chto' and words that do not border on those or on a trigger word

'Vy znate' or 'potomy chto'	Code switch		
	Yes	No	% Yes
Yes	25	40	38.5
No	226	2063	9.9

The results show that *vy znate* and *potomy chto* preceded a code switch significantly more often than expected under chance. Note that this does not tell us anything about the directionality of the relation between those discourse connectors and code switching. We can think of several interpretations of this relationship. The first possibility is that the discourse connectors triggered the code switches. The similarity of the use of the discourse connectors in the two languages, or their frequent use in code switched utterances might have connected them strongly to both languages and given them triggering potential. The second possibility is that the code switches triggered the use of the discourse connectors. The speaker might have felt the need to embed her code switches in a particular structure, and thus the code switches might have called for the use of the discourse connectors. The third possibility is that there is one reason for both the use of the discourse connectors and the code switches. For example, if the speaker was faced with retrieval problems, she might resort to habitual discourse elements while trying to access the syntactic structure or lexical element in either of her two languages.

Thus, we do not wish to claim that the discourse connectors *vy znate* and *potomy chto* triggered code switching, but there clearly is some relationship between the two, such that the discourse connectors often occurred directly before a code switch.

General discussion

In this paper, we presented new evidence that the production of a cognate can trigger a code switch. In previous research (Broersma & De Bot, 2006), we showed that words spoken directly after a cognate or in the same basic clause as a cognate were significantly more often code switched than other words, in the speech of Moroccan Arabic – Dutch bilinguals. In the present paper, we replicate this finding with three data sets.

The amount of lexical overlap and the typological similarity of the languages in these data sets were widely different. In the Moroccan Arabic – Dutch data, 5% of the words were cognates, in the two Dutch – English corpora, this was 68% and 64%, and in the Russian – English data 3%. Typologically, both Moroccan Arabic and Dutch, and Russian and English are very different, whereas Dutch and English are typologically more similar. With all these language pairs, we found that cognates enhanced the occurrence of code switching. Thus, triggered codeswitching is not incidental and limited to particular language pairs but a robust and general phenomenon.

In line with the Moroccan Arabic – Dutch data, in the present data, code switches were more frequent in basic clauses containing a trigger word, as well as immediately after a trigger word. There was no increase of code switching immediately before a trigger word.

We investigated which kinds of words can trigger a code switch. In the Moroccan Arabic – Dutch data, all trigger words were nouns, and most of them proper nouns. In the Dutch – English and Russian – English data, trigger words occurred in all grammatical classes. In all data sets, we found that cognates, overlapping in word form and in word meaning, triggered code switching.

Next, we investigated whether both form and meaning overlap were necessary for triggering to take place. With the Dutch – English data, the large number of cognates made it impossible to assess this question properly. With the Russian – English data, however, we assessed the effect of false friends, which overlap in word form but not in word meaning. The results showed that the presence of a false friend also led to an increased chance that the following word was code switched. Thus, it seems that form overlap alone may be sufficient to trigger a code switch.

We further investigated how transparent a cognate needs to be in order to trigger a code switch. We looked at Russian – English cognates that were, sometimes extensively, embedded in Russian morphology. The results showed that (while there was a triggering effect) there were no significant differences in the amount of code switching after transparent, less transparent, or masked primes, and that heavily masked cognates triggered code switches as much as transparent cognates without any morphological embedding did. Thus, triggering seems to be caused by the stem of a word, and even the extensive Russian morphology does not diminish a cognate's capacity to trigger a code switch.

With the Russian – English data, we investigated whether trigger words spoken by one speaker can trigger a code switch in the speech of another speaker. Although a host of sociolinguistic studies have shown the importance of the interlocutor's speech for code switching (e.g., Myers-Scotton, 1993), and recent research has shown that the interlocutor's code switching behavior has a direct impact on another speaker's code switching (Kootstra, Van Hell, & Dijkstra, this volume), we found that the interviewer's use of trigger words did not enhance code switching in the informant's speech. Thus, it seems that the trigger word needs to be produced rather than perceived in order to trigger a code switch.

Finally, we assessed the relation between discourse connectors and code switching. We found that code switches were very often preceded by discourse connectors. This might suggest that the use of discourse connectors induces code switching or vice versa, or both might result from the same cause.

In the present study, we found that both the word level analysis and the clause level analysis explained triggering well. We did not attempt to tease apart which analysis explained the code switching patterns in the data better. Previous work suggests that the clause level analysis explains code switching better than the word level analysis when there are few trigger words and code switches in the data (Broersma & De Bot, 2006). The word level analysis, on the other hand, seems to give a better and more precise account of the data than the clause level analysis when the data contain a large amount of trigger words and code switches (Broersma, to appear). Those studies thus showed that both approaches have their merits, and that their predictions overlap to some extent, which the present research confirms.

The data were selected to contain a reasonable amount of code switching. Between 16 and 35% of all basic clauses contained a code switch in the speech of the four Dutch – English informants from New Zealand, and 12 and 14% did for the two Dutch – English informants from Australia, and 18% for the Russian – English informant. Thus, in these data, the informants code switched regularly, and their code switching was influenced by their production of cognates. We assume that when speakers do not feel free to code switch, it is not likely that a cognate will induce them to do so. Thus, the effects of cognates are presumably limited by social and pragmatic considerations (e.g., Blom & Gumperz, 1972; Myers-Scotton, 1993). Nevertheless, when the circumstances are such that the pile of sand is about to start sliding, a cognate might be the last grain of sand that causes the avalanche.

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CHAPTER 6

Two speakers, one dialogue

An interactive alignment perspective on code-switching in bilingual speakers

Gerrit J. Kootstra, Janet G. van Hell, and Ton Dijkstra*
Radboud University Nijmegen, the Netherlands
The Pennsylvania State University, USA

In code-switching research, a distinction can be made between approaches that focus on linguistic and cognitive variables within single individuals and approaches that emphasize processes between individuals in their social and interactive context. These approaches differ in terms of both theory and methodology, and are difficult to integrate. In this chapter, we build on recent theoretical developments in psycholinguistics and propose a model of interactive alignment in code-switching. The model takes dialogue as the basic unit of analysis and interactive alignment as the main cognitive mechanism underlying regularities at both the individual and social level of processing. Along with the confederate-scripting technique as the central method to test its assumptions, we suggest that this interactive alignment model provides a way to integrate different approaches to code-switching in terms of both theory and methodology.

Keywords: code switching, interactive alignment, psycholinguistics, interaction, confederate paradigm

* Gerrit J. Kootstra, Behavioural Science Institute, Radboud University Nijmegen, the Netherlands; Janet G. van Hell, Behavioural Science Institute, Radboud University Nijmegen, the Netherlands, and Department of Psychology, The Pennsylvania State University, USA; Ton Dijkstra, Donders Institute for Brain, Cognition, and Behaviour: Centre for Cognition, Radboud University Nijmegen, the Netherlands.

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Correspondence concerning this chapter should be addressed to Gerrit J. Kootstra, Behavioural Science Institute, Faculty of Social Sciences, Radboud University Nijmegen, P.O. Box 9104, 6500 HE, Nijmegen, the Netherlands. E-mail: G.Kootstra@bsi.ru.nl.

Introduction

Code-switching is one of the most fascinating behaviors of bilinguals. This mixing of languages within an utterance is among the few forms of behavior that overtly reflect the interaction of languages in bilingual speech. Perhaps it is therefore not surprising that researchers interested in quite different aspects of bilingualism have been intrigued by this phenomenon and have studied its regularities. The result of this is a wealth of studies investigating the regularities and mechanisms of code-switching in all kinds of dimensions, resulting in socio-pragmatic (e.g., Auer 1998; Blom & Gumperz 1972; Li Wei, Milroy & Ching 1992; Myers-Scotton 1993), grammatical (e.g., MacSwan 2000; Muysken 2000; Myers-Scotton 2002; Poplack 1980), cognitive (e.g., Costa & Santesteban 2004; Meuter & Allport 1999; Meuter, this volume), and neurocognitive (e.g., Van Hell & Witteman, this volume) approaches.

The various approaches to code-switching differ in their scientific roots, theoretical assumptions, terminology, research goals, and methodological standards. This makes it difficult to relate these approaches to each other (Gullberg, Indefrey, & Muysken, 2009; Myers-Scotton 2006). For instance, whereas socio-pragmatic and grammatical studies generally use naturally occurring utterances in which code-switches are analyzed at the sentence or discourse level, cognitive studies typically use controlled experiments that are restricted to the level of single words, in which participants are forced to switch languages while they are naming pictures in a list. Moreover, these cognitive studies use the term *language switching* instead of the term *code-switching*, which is preferred in socio-pragmatic and grammatical studies. Another major distinction is that some approaches focus on code-switching as a process *within* individuals and others focus on code-switching as it occurs *between* individuals: Grammatical and cognitive studies are typically centered around the linguistic or cognitive system within one single individual, whereas socio-pragmatic studies concentrate on the influence of the situational context and the dynamics between conversation partners on code-switching behavior.

We believe that code-switching research will benefit from a merging of these approaches. What is more, if we regard an individual speaker as "someone in whom all sorts of influences on language use are expressed" (De Bot 1992: 2), it is even impossible to separate intra- and interindividual aspects of code-switching or to distinguish grammatical, social, and cognitive processes in code-switching. A more comprehensive account of code-switching is therefore required in which both individual and social variables are represented, and in which the interplay of these variables is explicitly specified. Such an account not only brings different theories together, but can also lead to an integration of methodological approaches.

In this chapter, we propose a model of interactive alignment in code-switching as an account that meets these requirements. This model is an extension of the interactive alignment model by Pickering and Garrod (2004), which specifies the cognitive mechanisms of language processing from a dialogue perspective instead of a monologue perspective (as is usually done in cognitive psychology). The first section of this chapter is directed at this dialogue perspective and discusses evidence that supports it. It also introduces the interactive alignment model. We then link the interactive alignment model to aspects of bilingual language processing and code-switching, relate it to existing cognitive accounts of bilingual language processing, and demonstrate how the alignment model can be extended to the study of code-switching and bilingual language processing. We will end with a discussion of methodological aspects that follow from this approach by presenting one of our studies, which examines Poplack's (1980) equivalence constraint in combination with interactive alignment.

A mechanistic psychology of dialogue

There are several reasons to adopt a dialogue perspective on language use, and in particular on code-switching. The first reason is that "humans are designed for dialogue rather than monologue" (Garrod & Pickering 2004: 8). This can be seen in the fact that dialogue is the main way in which children learn (to use) language, is present in every linguistic community (as opposed to language in monologue, such as reading and writing), and can therefore be seen as the basic setting of language use (Clark 1996; Garrod & Pickering 2004; Schober 2006). A second reason is that using language in dialogue situations is generally much easier than in monologue situations: Giving a lecture or listening to a speech, for instance, usually requires more attention and concentration than talking to someone in interaction (Clark 1996; Garrod & Pickering 2004; Schober 2006). A reason to adopt a dialogue perspective that is specific to code-switching is that code-switching is a phenomenon that typically occurs in dialogue situations; code-switches in more institutionalized language and monologue, such as speeches or written texts, are relatively scarce (but see Callahan 2004). Based on these observations, it makes sense to examine and analyze code-switching from a dialogue perspective, with monologue as a more exceptional mode of speech.

So why is dialogue easier than monologue? The answer to this question lies mainly in the different goals of dialogue and monologue, and in the different ways in which representations from different levels of processing are accessed in dialogue as compared to monologue. In traditional monologue accounts (e.g., Levelt 1989), the goal of speaking is to encode a certain message into an articulatory output, which develops through a step-by-step procedure with a fixed directionality from intention to the selection of words and syntax to articulation. In dialogue, on the other hand, the goal is for dialogue partners to come to a common conception of what they are talking about; otherwise, the dialogue would fail (Clark 1996; Pickering & Garrod 2004; Schober 2006). This common goal makes dialogue an essentially joint process, which has a significant effect on the interlocutors' contributions to the conversation. That is, in order to achieve common understanding, speakers in dialogue will coordinate and accommodate their linguistic choices to the ongoing conversation (Schober 2006). They will use each other's words, syntactic constructions, and so on, which will result in an increased mutual understanding as an emergent property of the conversation. This opportunity of exploiting each other's language behavior restricts the dialogue partners' language production choices, and this is what makes dialogue so much easier than monologue: Instead of starting every utterance from scratch, dialogue partners can make shortcuts in their language production and coordinate each other's linguistic choices to facilitate their own language production processes (Garrod & Pickering 2004; Schober 2006).

Experimental studies found evidence for this linguistic coordination at the level of lexico-semantics (e.g., Brennan & Clark 1996; Clark & Wilkes-Gibbs 1986; Garrod & Anderson 1987), syntax (e.g., Branigan, Pickering, & Cleland 2000; Huttenlocher, Vasilyeva, & Shimpi 2004; Levelt & Kelter 1982), phonology (Bradlow & Bent 2008), and articulation (Giles, Coupland, & Coupland 1991; Giles & Powesland 1975; Goldinger 1998). Moreover, coordination at one level of processing has been found to lead to coordination at other levels as well (e.g., Cleland & Pickering 2003). In addition to these experimental studies, studies of natural dialogue have collected instances of linguistic coordination outside the laboratory (e.g., Aijmer 1996; Gries 2005; Schenkein 1980; Tannen 1989). What should be clear from this is that linguistic coordination in dialogue is pervasive and present at all levels of linguistic representation.

Although these findings provide compelling evidence of linguistic coordination inside and outside the lab, they do not necessarily require a dialogue account to explain them: The findings can still quite simply be explained in terms of priming of linguistic structure that is not necessarily socially motivated. We therefore need more evidence to demonstrate the added value of a dialogue perspective on language use relative to a monologue perspective. This evidence comes, firstly, from the way interlocutors adapt to each other's language as a function of the specific role these interlocutors play in a conversation. Brennan and Clark (1996), for instance, demonstrated that the degree of linguistic coordination between two interlocutors changed when a new interlocutor entered the conversation. Likewise, Branigan, Pickering, McLean, and Cleland (2007) found a weakening of syntactic coordination between dialogue partners when two participants took turns in describing events to a third person who only listened but did not actively participate in the dialogue. A second line of evidence comes from comparisons of syntactic priming effects in monologue and dialogue. Syntactic priming in monologue, in which a prime is given through earphones, is generally weaker than syntactic priming in actual conversational situational situations, in which the prime is given by a real person (Pickering & Garrod 2004).

These observations indicate that linguistic coordination is not merely caused by a primed response to a certain stimulus, but is grounded in the social, situational, and conversational circumstances in which it takes place. The findings encourage the use of dialogue as a basic unit of analysis in research on language use. This insight inspired Pickering and Garrod (2004) to construct a mechanistic psychology of dialogue, which resulted in their interactive alignment model.

The interactive alignment model of dialogue

The interactive alignment model specifies the different levels of representation present in dialogue and the way in which these levels interact within and between interlocutors. It is depicted in Figure 1. As shown in the figure, the model consists of two speakers (A and B) in one system. The processing levels that are distinguished are the situation model level, the semantic level, the syntactic level, the lexical level, the phonological level, and the phonetic level. These levels are interconnected within individuals (vertical arrows) and between individuals (horizontal arrows). The assumed levels of processing are based on existing models of speech processing (most notably, Levelt 1989) and theories of discourse processes (e.g., Zwaan & Radvansky 1998). The directionality of the connections and the way information flows between these levels of processing is based on accounts of mimicry in social cognition (e.g., Dijksterhuis & Bargh 2001) and theories of automatic resonance processes (e.g., Goldinger & Azuma 2004; Schütz-Bosbach & Prinz 2007; see also Garrod & Pickering 2007).

The question is now how the observations about dialogue discussed above are reflected in this model. As said before, the central goal of dialogue is for the interlocutors to come to a similar conception of what one is talking about. In the interactive alignment model, this idea is represented in the notion of alignment of situation models. Alignment is defined as having shared representations at some specific level, and a situation model is defined as a person's conception of the space, time, entities, intentionality, and causality involved in the discourse at hand (Pickering & Garrod 2004; Zwaan & Radvansky 1998; Zwaan & Rapp 2006). In concert with this alignment of situation models there will be alignment of linguistic representations (or: linguistic coordination). This is represented by the bidirectionality

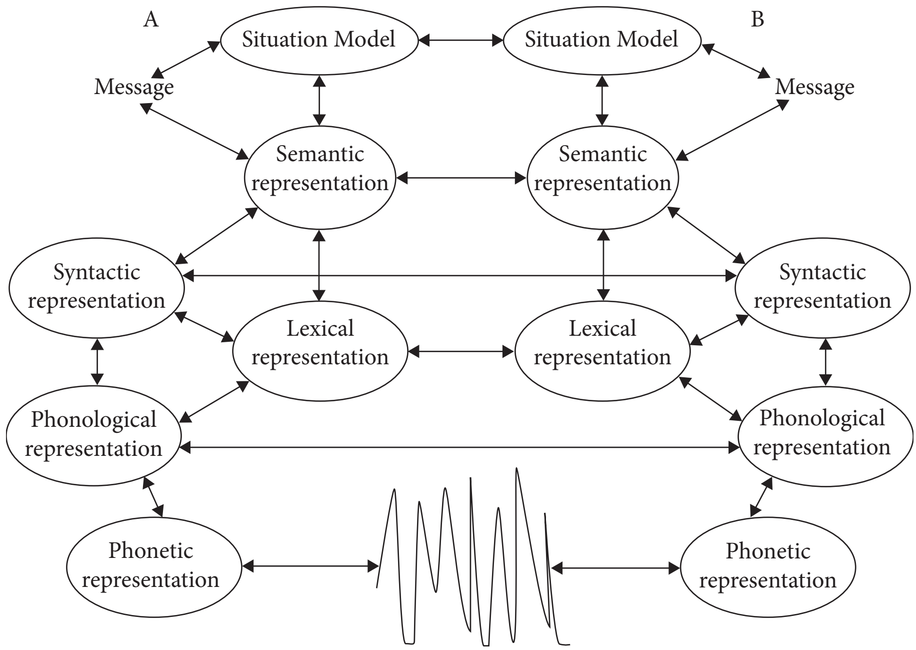

Figure 1. The interactive alignment model (from: Pickering & Garrod 2004)

of the arrows within and between the situation models and all other levels of processing in speaker A and B. The arrows show a direct connection between people's situation models and the language they use. Thus, language processing in this model will result in a resonance between the situation model and the language people use, in which the representations at the different processing levels within and between conversation partners will become increasingly aligned and attract the dialogue towards an optimal alignment of situation models.

An appealing aspect of the interactive alignment model is that it assumes both automatic and strategic sources of alignment (Garrod & Pickering 2007). The assumption of automatic alignment is inspired by research in social cognition that found a direct link between perception, action, and mental states (e.g., Dijksterhuis & Bargh 2001; Schütz-Bosbach & Prinz 2007). Accordingly, alignment takes place by means of automatic priming between language perception, language production, and situation models. Strategic alignment, on the other hand, is more under conscious control of the speaker and can take place via specific beliefs about one's interlocutor, agreements between interlocutors, and feedback from interlocutors (Garrod & Pickering 2007). This is also in line with Speech Accommodation Theory, which assumes that people accommodate their speech styles on the basis of their perceptions of the social environment and to gain a specific goal, such as communicative efficiency, social approval, or the specification of one's social identity (cf., e.g., Beebe & Giles 1984). By assuming these different sources of alignment, the interactive alignment model adheres to both cognitive and social mechanisms of language use.

Another appealing aspect of the model is that it assumes a direct coupling between processes of language production and language comprehension, as is represented by the arrows between speaker A and B. This parity between production and comprehension is based on the idea that interlocutors jointly construct utterances in dialogue, in which the distinction between processes of comprehension and production fades. In fact, the coupling of processing levels between speaker A and B in comprehension and production enables alignment to occur in the first place. By assuming this direct coupling between language production and language comprehension processes, the model provides a relatively complete picture of language processing as a whole and a clear view on the interface between language production and comprehension.

The interactive alignment model gives a powerful and explicit account of language processing in dialogue. It explains language adaptation and accommodation between individuals, and specifies the relationship and interactions between the different levels of processing involved in speech production and comprehension. Despite these attractive characteristics, it has not been applied yet to code-switching and the question how language choice or the degree in which the bilinguals' different languages are active is aligned through the model's different levels of processing[1]. The model also remains silent on how the interaction of languages throughout the entire dialogue is reflected in patterns of code-switching and other types of cross-linguistic interaction. It is therefore not yet capable of explaining how code-switching can occur from the process of being engaged in a bilingual dialogue, and needs to be extended and related to existing accounts of bilingual language processing.

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1. We do not mean to say that bilingual language processing has never been studied in dialogue, because Hartsuiker and colleagues have done so (Bernolet, Hartsuiker, & Pickering 2007; Hartsuiker, Pickering, & Veltkamp 2004; Schoonbaert, Hartsuiker, & Pickering 2007). However, the models these researchers use to account for their data are monologue models that only focus on the organization of lexical and syntactic representations within a single bilingual; they use alignment with a dialogue partner as a methodological tool, but not as an explanatory factor in their models.
Costa, Pickering, and Sorace (2008) recently studied interactive alignment in second language dialogue. Their study focuses specifically on the mechanisms of alignment in second language learners when second language learners are speaking in their second language.

Toward an interactive alignment model of code-switching in bilinguals

A central question in cognitive research on bilingual language processing is how to account for the ability of bilinguals to keep their languages apart in language production as well as to switch back and forth between their languages (cf., De Bot 2004; Poulisse & Bongaerts 1994). The ability to keep languages apart suggests that bilinguals can selectively activate or inhibit items from different languages, while the occurrence of code-switching and other types of cross-linguistic interaction, such as language transfer, implies that they co-activate items from different languages at the same time. Cognitive models of bilingual processing assume that code-switching and other forms of cross-linguistic interaction, as well as the ability to keep languages apart, are based on the same underlying cognitive architecture and involve the same mechanisms.

A central notion in approaches to bilingual language processing is the distinction between linguistic items or structures that *overlap* between languages and items that are *language-specific*. Overlapping items or structures are associated with more than one language. This makes the occurrence of cross-linguistic interaction more likely than in language-specific structures, which are not so tightly associated with more than one language. The distinction between overlapping and language-specific structures is reflected in various approaches to the way different languages influence each other. In experimental psychology, for example, issues of selective or non-selective lexical access are studied by comparing the processing of overlapping lexical items with the processing of language-specific items (cf., e.g., Dijkstra 2005). Similarly, in the field of second language acquisition, cross-linguistic influence (or: transfer) is assumed to result from "the *similarities* and *differences* between the target language and any other language that has been previously […] acquired" (Odlin 1989: 27, our italics; see also Odlin's contribution to this volume). Finally, numerous accounts of code-switching are based on similarities and differences in the way different languages map meaning onto form (e.g., Deuchar 2005; Muysken 2000; Poplack 1980).

As the degree of overlap and language-specificity between languages is such a major source of language interaction in bilingual processing, it is important to know at which levels of processing this overlap is present, and in what way it affects the speech production process in bilinguals. As a first step in applying the interactive alignment model to bilingualism, we will now discuss how overlap and language-specificity affect language processing in bilinguals across the different processing levels of the interactive alignment model.

Situation model

The situational dimensions in which a certain discourse takes place carry important language information. Grosjean (2001), for instance, argued that interlocutors, the physical location, and the functionality of the discourse, amongst other things, have an important impact on the state of activation of the bilingual's languages, which will affect the way bilinguals process their different languages[2]. This is demonstrated by Sachdev and Bourhis (1990), who found that bilinguals in Canada accommodated their language choice behavior and code-switching patterns to the discourse situation. In a similar vein, Myers-Scotton (1993) demonstrated that the social norms involved in the discourse and the negotiation of conversational identities influence language choice in bilinguals, resulting in code-switches that are either marked or unmarked, depending on the situation. Finally, Ng and He (2004) also found instances of code-switching that were influenced by the situation: in tri-generational family conversations of Chinese immigrants in New Zealand, parents mostly code-switched from English to Chinese when they talked to the Chinese-dominant grandparents, whereas they predominantly code-switched from Chinese to English when they talked to the English-dominant grandchildren.

In addition to these naturalistic data, there is experimental evidence of the influence of the situation on language choice. In a study based on Grosjean and Miller (1994), Fokke, De Ruyter de Wildt, Spanjers, and Van Hell (2007) examined how Dutch-English bilinguals retold a movie fragment to either a regular Dutch university student or an exchange student from the USA, who often code-switched between Dutch and English. The participants code-switched more often to the exchange student than to the Dutch student, which can be seen as evidence for language choice alignment as a function of the conversational situation. It is therefore evident that the situational dimensions of a discourse can cue different kinds of language information, and that people adjust their language choices to these situational characteristics.

Semantic level

Overlap and language-specificity at the semantic level is reflected in the observation that it is in principle possible to express whatever meaning in whatever language, but that some languages may be better suited to express a particular thought than others (cf., Ameel, Storms, Malt, & Sloman 2005; Francis 2005; Odlin 1989).

2. Although these characteristics are supposed to have an important bearing on the level of activation of the bilingual's languages, Van Hell and Dijkstra (2002) demonstrated that it is not possible to reduce a language's activation level to zero.

Such a cross-linguistic difference in the mapping of non-linguistic to linguistic meaning can, for instance, be seen in Spanish as compared to English: Spanish has two different words for the different senses of the English word 'to know', namely 'saber' (to know in the sense of a positive result to an uncertain situation, like knowing the answer to a question or knowing what tomorrow's weather will be) and 'conocer' (to know in the sense of being familiar with the existence of something or someone); English simply always uses the verb 'to know' (Odlin 1989). Such cross-language differences can sometimes lead to a code-switch: Bilinguals may choose the more specific words from their other language in order to express the meaning they wish to convey in a more precise way (Heredia & Altarriba 2001).

Cross-linguistic interaction at the semantic level has also been found by Kellerman (1978). Kellerman presented Dutch learners of English with Dutch sentences containing different senses of the verb 'breken' (*to break*) and asked them whether they would translate these sentences using the English verb 'to break'. The senses of the verb 'breken' ranged from more prototypical ('hij breekt zijn been' – *he broke his leg*) to less prototypical ('een spelletje zou de middag een beetje breken' – *A game would break up the afternoon a bit*). It turned out that participants preferred the use of 'to break' in the more prototypical sentences, which demonstrates that semantic transparency of words that have the same meaning and form across languages affected these learners' translations.

In a later study, Van Hell and De Groot (1998) also studied the mappings between meaning and form in bilingual memory. Van Hell and De Groot asked Dutch-English bilinguals to come up with a verbal association to nouns and verbs that varied in terms of their concreteness and cognate status. They were asked to do this twice: once in the same language as the stimulus (e.g., stimulus: *rok* [meaning *skirt*]→ hypothetical response: *jurk* [meaning *dress*]) and once in the other language (e.g., stimulus: *rok* → hypothetical response: *dress*). Comparing the associations in the same language to those in the other language, it turned out that associations to concrete words, cognates, and nouns were more often translations of each other than associations to abstract words, non-cognates, and verbs. This suggests that some mappings between concepts and their verbal associates are more tightly connected across languages than others, which can have an important bearing on bilinguals' linguistic behavior.

Syntactic level

Different languages can have different possible word orders or syntactic structures. Word orders may overlap between different languages or be specific to a particular language. In English and Dutch, for instance, SVO (<u>S</u>ubject-<u>V</u>erb-<u>O</u>bject) word order exists in both languages, whereas VSO and SOV word orders are only possible in Dutch. An SVO word order may thus cue the use of both Dutch and English, while the use of VSO or SOV exclusively cues Dutch. Accordingly, code-switching is more difficult in word orders that are language-specific than in word orders that overlap between languages. This observation is confirmed in studies that focus on syntactic equivalence or congruence as a constraining factor in the occurrence of code-switches (e.g., Deuchar 2005; Poplack 1980; Poplack & Meechan 1995).

Cross-linguistic interaction at the level of syntax is also observed in studies of syntactic priming across languages. Syntactic priming (also called *syntactic persistence* or *structural priming*) refers to the phenomenon where the processing of an utterance is facilitated when a previous utterance had the same syntactic structure (e.g., Pickering & Branigan 1999). Syntactic priming across languages, then, is the facilitation in processing of an utterance *in a particular language* by a preceding utterance with the same or a related syntactic structure *in a different language*. In one of the first studies examining this phenomenon, Loebell and Bock (2003) asked German-English bilinguals to describe pictures in one of their languages after they had reproduced a specific sentence with a specific syntactic structure in their other language. The sentences and pictures they used employed syntactic structures that either overlapped between German and English or were language-specific. Based on the hypothesis that cross-linguistic overlap in syntax causes the priming effect, Loebell and Bock expected syntactic priming to occur for the overlapping structures, but not for the non-overlapping structures. This is exactly what they found.

The cross-language syntactic priming effect has been replicated in a number of dialogue tasks (Bernolet, Hartsuiker, & Pickering 2007; Hartsuiker, Pickering, & Veltkamp 2004; Schoonbaert, Hartsuiker, & Pickering 2007). In these studies, a confederate describes a picture in one language (the prime), and a naïve participant subsequently describes a picture in another language (a more thorough discussion of this methodology will follow later in this chapter). This cross-language syntactic priming effect in dialogue demonstrates that interactive alignment of syntactic representations can occur across different languages. Both within and between interlocutors, then, overlap of syntactic structures between languages affects language processing in bilinguals.

Lexical level

The lexical form of words can also overlap between languages, as in cognate words such as the Dutch-English *hotel-hotel* or *tomaat-tomato*. In the code-switching literature, the influence of cognates is incorporated in the concept of triggered code-switching (e.g., Broersma & de Bot 2006; Clyne 1980). The triggering hypothesis holds that cognate words can facilitate, or trigger, a switch to the other language. In a corpus containing code-switches between Dutch and Moroccan-Arabic, Broersma and De Bot (2006) found evidence for this kind of triggering (see Broersma, Isurin, Bultena, & De Bot (this volume) for more evidence of triggered code-switching). Interestingly, this notion of lexical overlap as a trigger of code-switching is analogous to the idea that word orders that are equivalent across languages keep both languages activated and thus facilitate code-switching (see De Bot, Broersma, & Isurin (this volume) for more information on triggering beyond the lexical level).

The influence of lexical overlap has further been tested in experimental studies on bilingual word production and comprehension. These studies often focus on the processing of cognates and false friends as compared to matched control words. While cognates overlap in both form and meaning, false friends overlap in form only (e.g., *pet*, which means *cap* in Dutch). Cognates are generally named quicker than matched control words (Christoffels, Firk, & Schiller 2007; Costa, Caramazza, & Sebastián-Gallés 2000), cause fewer tip-of-the-tongue states (Gollan & Acenas 2004), and are easier to associate to (Van Hell & De Groot 1998). In contrast, false friends are generally processed slower than matched control words (Dijkstra, Grainger & Van Heuven 1999; Jared & Szucs 2002).

The cognate facilitation effect has also been studied outside the level of the single word, by means of studies that examine the processing of cognates in a sentence context. A robust finding is that the degree of semantic constraint present in the sentence context has a high impact on effects of cross-linguistic interaction in the reading of cognates. That is, while cognates are processed faster than matched control words when embedded in low constraint sentences, the cognate facilitation effects are strongly reduced or even disappear in high constraint sentences (Schwartz & Kroll 2006; Van Hell & De Groot 2008). Dijkstra, Van Hell, and Brenders (in preparation) elaborated on these studies and examined cognate recognition in a sentence context in combination with language switching. They presented Dutch-English bilinguals with English versions of non-identical cognates (e.g., *doctor*, which is *dokter* in Dutch) in sentence contexts that were either English or Dutch (e.g., "The man brought his sick daughter to the *doctor*" vs. "De man bracht zijn zieke dochter naar de *doctor*"). English cognates were responded to faster than non-cognate controls when preceded by an English sentence context, but less so when preceded by a Dutch sentence context. This finding suggests that overlapping words are processed differently than language-specific words, and that the language information that is present in the sentential context has important consequences for the processing of later words from another language.

In addition to the effects of lexical overlap *within* individuals, Angermeyer (2002) observed cross-language lexical alignment *between* individuals. Angermeyer examined patterns of language choice in a trilingual family in Canada, in which different family members spoke to each other in different languages. He found that the members of this family repeated certain lexical items after each other, even in case the languages they used were different. The result of such instances in which the languages of the conversation partners are different but lexical items are repeated exactly as they are, is a code-switch. Angermeyer explained this type of switching in terms of the creation of coherence between utterances in different languages. This explanation is highly compatible with interactive alignment.

Phonological level

Some phonological forms occur in more than one language and others are clearly language-specific. With respect to the role of phonology in code-switching, cross-linguistic overlap at this level of processing can be hypothesized to facilitate code-switches in a similar way as overlap at the syntactic and lexical level (see also De Bot, Broersma, & Isurin, this volume).

Jared and Kroll (2001) found that overlap of phonological representations across languages affected word processing in a specific language. They asked French-English and English-French bilinguals to name French words that have many English phonological neighbors and English words that have many French phonological neighbors. Naming latencies turned out to be longer for these items than for words that did not have phonological neighbors across languages. In another study, Colomé (2001) asked Catalan-Spanish bilinguals to decide whether certain phonemes were present or not in the Catalan names of pictures that were presented to these participants. She found that bilinguals were particularly slow when the phoneme was not present in the Catalan word but present in its Spanish translation equivalent. Finally, Roelofs (2003) had Dutch-English bilinguals participate in a form preparation task. In this task, participants learn certain word pairs and are then presented with a particular word of which they have to produce the other word from that pair. Roelofs found a preparation effect across languages: Word pairs that shared initial segments across languages were produced faster than word pairs that had different initial segments. In short, then, overlap and language-specificity at the phonological level affects the language behavior of bilingual speakers.

Phonetic level

Language-specific information at the phonetic level is most clearly reflected in speech accent. Accent characteristics carry much language information and are often a first source of information for the detection of a person's mother tongue (e.g., Flege 1984). Speaking a certain language with an accent from another language may activate both languages to a certain extent and therefore increase the probability of code-switches. To the best of our knowledge, however, this has not yet been studied.

Other evidence of overlap and language-specificity at the phonetic level suggests that bilinguals' phonetic categories can both converge (e.g., Bullock & Gerfen 2004; Flege 1987; Flege, Schirru, and MacKay 2003) or diverge (e.g., Flege & Eefting 1987) across languages. Moreover, speakers appear to accommodate phonetically to the accent used by their conversation partner (Giles et al. 1991; Giles & Powesland 1975; Goldinger 1998).

A cognitive account of language interaction in bilinguals

As is clear from the discussion above, the situational dimensions of the discourse as well as the linguistic items or structures at each level of the interactive alignment model can be language-specific or shared between languages. This leads to specific degrees in which items from the bilingual's different languages are (co-) activated, which forms the basis of specific patterns of code-switching, language transfer, and cross-linguistic interaction. Moreover, we have shown that such patterns of cross-linguistic interaction not only occur within one single individual, but also between individuals. The question is now how cognitive models of bilingual language production account for these findings, and how these accounts can be extended to the interactive alignment model.

In most cognitive models, bilingual language production is seen as the selection of linguistic items from a neural network in accordance with a particular language intention (cf., e.g., Costa 2005; De Bot 2004; La Heij 2005; Poulisse & Bongaerts 1994). This neural network consists of linguistic items from the different languages the person knows, which are assumed to be interconnected on the basis of inter-item associations. These associations can be made within one specific language, but they can also be made between items that share a particular feature across languages. Associated items are activated by a mechanism called *spreading activation* (e.g., Dell 1986; Poulisse & Bongaerts 1994; Roelofs 1992): When an item is activated, a certain proportion of its activation is spread to its associated items (note that this mechanism is similar to the mechanism of resonance assumed in the interactive alignment model). Speaking in a specific language is then possible because items belonging to a specific language spread activation to other items belonging to that language. Switching between languages is possible because linguistic items can also spread activation to associated items from the other language. Especially at points where there is much overlap between languages, items from the other language will receive a relatively large amount of activation.

Although this architecture of bilingual memory and the mechanism of spreading activation provide a viable explanation for how different language items can be co-activated, it is still unclear how activation of linguistic items is controlled and monitored with respect to a certain language choice. In the literature, multiple alternative mechanisms are suggested (cf., Kroll, Bobb, Misra, & Guo 2008). The first alternative is the postulation of a language selective mechanism. This mechanism enables bilinguals to directly ignore items from the unintended language and exclusively select items from the intended language (e.g., Costa 2005). The other alternative is reactive inhibition. This view maintains that items from both languages are candidates for selection but that items from the unintended language are eventually inhibited (e.g., Green 1998). Still another alternative is the postulation of a language cue that is added to the preverbal message, which makes sure that words from the intended language attain higher activation levels than words from the unintended language (La Heij 2005). What is common about these alternatives is that they all postulate a control mechanism that should prevent unintended items to be selected. The alternatives differ in their assumptions regarding the locus of language selection and the directionality of information flow in bilingual speech. The language-specific-selection-mechanism approach assumes that cross-linguistic interaction beyond the lemma level does not have an effect on language selection, whereas the reactive-inhibition approach assumes that language interaction at these lower levels of processing (phonology and phonetics) can feed back to the lemma level and therefore affect language selection (cf., Kroll et al. 2008; Kroll, Bobb, & Wodniecka 2006); the language cue approach assumes that no language-selective mechanisms or reactive inhibition is necessary: Lexical selection is held to be purely based on the activation levels of words, which are modulated by the language cue (La Heij 2005).

A final issue bilingual language production models need to account for is how a certain language choice is established in the first place. Since many studies on bilingual production use tasks in which the intended language for production is already induced on the research participants, this issue has received relatively little attention. In our discussion above, we have shown that language interaction takes place at and across every single level of processing, and that language choice is influenced by the interaction between the situation as well as the linguistic items and structures that are used in the discourse. This observation has also been made by De Bot (1992), who stated that language choice can be on a range from one language only to completely mixed, depending on the situation. De Bot's (2004) Multilingual Processing Model further specifies how this language choice, which is based on situational characteristics, is influenced by the linguistic materials used during language production. De Bot's model is based on Levelt's (1989) blueprint of the speaker, and assumes that speaking is a process of selecting and subsequently articulating the appropriate words and syntactic structures belonging to a specific communicative intention. The language intended for speech is part of this communicative intention as well, and is monitored and controlled by what is called a *language node*. The language node spreads language choice activation to the different levels of processing involved (words, syntax, phonology, articulation), and the activated items or structures from these different levels of processing send language activation back to the language node. In cases of cross-language overlap of these items, the language node will receive language activation from more than one language, which could modify the degree in which the bilingual's languages are active and affect the bilingual's language choice. Thus, De Bot's model assumes that language choice develops by means of the spreading of top-down language choice information in interaction with bottom-up information from the linguistic items and structures that are used.

To sum up, although current cognitive models of bilingual language production can account for the way languages interact during language production and the way items from the intended language for production are selected and controlled, some issues are still unclear. First of all, language production models differ in their assumptions about the locus of language selectivity and whether language interaction at the phonological and phonetic level can feed back to the lemma level to influence the selection of the intended linguistic items. Furthermore, there is a rather strict distinction between models of bilingual language comprehension (e.g., Dijkstra & Van Heuven 1998; 2002) and bilingual language production (e.g., Costa 2005; De Bot 2004; La Heij 2005; Poulisse & Bongaerts 1994). Although these models provide detailed accounts of the processes they intend to explain, they remain relatively silent on how language comprehension and production work together in bilingual language processing. The most important issue, however, is that current models of bilingual processing are restricted to the level of the single individual: Cognitive models of bilingual language production only provide an account for cross-linguistic interaction within single individuals and do not provide information about how language processing takes place between conversation partners. Applying the interactive alignment model to bilingual processing and code-switching, may give us a more complete view of bilingual processing and how it is embedded in a discourse situation.

An interactive alignment model of code-switching and bilingual processing

The interactive alignment model and cognitive models of bilingual production are similar in many ways. As the interactive alignment model and models of bilingual speech production are both based on the same monolingual accounts of speech production in monologue (most notably, Levelt 1989), the assumed levels of processing in the interactive alignment model are basically the same as the ones assumed in models of bilingual production. The mechanisms of alignment in dialogue and spreading activation in bilingual language processing are also highly compatible: Both mechanisms revolve around the exchange, or spreading, of activation patterns from different levels of the system or network, resulting in an interactive pattern of associated representations.

What makes the interactive alignment model different is that it departs from the situation model instead of a conceptual representation, and takes dialogue as the basic unit of analysis instead of monologue. In this view, the language user does not merely base his or her linguistic choices on the situation; the language user and his or her linguistic choices are *an inherent part* of the discourse situation. This is a much more dynamic view of language processing, in which situational, linguistic, and cognitive factors influence the act of language processing in parallel. The question now arises how aspects of bilingual processing can be integrated in this view.

As we have argued above, cross-linguistic interaction and code-switching is accounted for by the concept of a neural network in which items from different languages can be connected to each other (a language-nonselective network). Especially points of overlap between languages will affect the degree in which items from both languages are activated, and increase the probability of cross-linguistic interaction. Extending the interactive alignment model with this notion of language processing in a language-nonselective network is sufficient to have it account for bilingual language processing and code-switching. That is, if the interactive alignment model assumes that language processing takes place in a language-nonselective network with a certain degree in which items from different languages can be co-activated, the interactivity of the system will automatically lead to the alignment of this activation pattern. Moreover, the interactive alignment model includes every level of processing that has been shown to affect this degree in which the different languages are active, and further specifies dialogue partners and the situation as being part of this model.

Interestingly, the interactive alignment model quite neatly solves the issues of current models of bilingual language processing that we have mentioned earlier. With respect to the locus of language selectivity, for instance, it follows naturally from the model that it cannot be fixed at some specific level of processing. That is, the interactive alignment model assumes a completely interactive system in which all levels of processing interact with each other and in which there is no fixed direction of information flow. In such a system, language selection is not the responsibility of one level of processing, but emerges from the interactivity of the system. This brings us to the issue of how a certain language choice is established. As the situation and the language that is used during the dialogue are an integral part of the system and these factors are in complete interaction with each other, the dialogue will automatically attract towards a certain language choice. Depending on the situation and the linguistic items and structures that are activated, then, dialogue partners' language choice can range from strictly monolingual to completely multilingual, in which dialogue partners switch back and forth between languages. What is more, because the interactive alignment model assumes both strategic and automatic sources of alignment, the model can account for both intentional and unintentional aspects of language choice. The interactive alignment model also provides an elegant account for the control and monitoring of activated linguistic patterns through what is called self-alignment (Pickering & Garrod 2004). Because the model assumes that language production goes hand-in-hand with language comprehension, language producers automatically monitor their speech by means of automatic alignment with the linguistic structures and items that they activate. This notion of self-alignment is just the same as alignment with a dialogue partner.

In short, the interactive alignment model is capable of accounting for code-switching and other aspects of bilingual language processing by means of the specification that language processing can include the activation of items from different languages and that the degree in which items from different languages are activated will be subject to alignment. Moreover, this extension of the interactive alignment model to bilingual processing not only improves the interactive alignment model itself, but also improves cognitive accounts of bilingual processing. It can account for the monitoring of language information, is specific about the way information flows through the model, and provides a sound explanation of how language users make a certain language choice. Most importantly, it integrates aspects of bilingual processing within and between individuals, and thus brings social and individual accounts of code-switching closer together.

Studying interactive alignment in code-switching: Methodological aspects

The interactive alignment model is not only theoretically appealing, it also offers interesting methodological possibilities to combine research questions from different areas of code-switching research. Most researchers who are interested in the social and grammatical constraints on code-switching design their studies with a strong focus on ecological validity. They typically examine code-switching on the basis of spontaneous, internally generated code-switches, in which the unit of analysis is the sentence or discourse level. Researchers who are interested in the cognitive mechanisms of language switching, on the other hand, typically come up with strictly controlled experiments, in which switches are analyzed on the basis of externally induced participant responses, in which the unit of analysis is mostly restricted to the level of the single word (cf., Gullberg et al., 2009; Myers-Scotton 2006).

Both Gullberg et al. (2009) and Myers-Scotton (2006) have suggested that these different methodologies should be brought closer together. Myers-Scotton argued for the experimental study of questions that are traditionally only examined in corpus research. Gullberg et al. suggested a convergence of approaches by presenting a range of techniques on a continuum from more natural to more controlled. In one of our studies (Kootstra, Van Hell, & Dijkstra, in preparation), we used a methodology that fits very well with the assumptions of the interactive alignment model, and also combines ecological validity with experimental rigor and may be of interest to linguists, sociolinguists, and psycholinguists alike: the confederate-scripting technique. This technique has been used earlier in studies of syntactic priming (cf., e.g., Branigan et al. 2000) and is highly suitable for the experimental study of language processing in discourse situations. The main feature of the technique is that experimental manipulations are embedded in a dialogue situation in which one of the dialogue partners is a confederate who is pre-instructed in terms of her behavior and language use. This embedding in dialogue situations makes it an excellent technique to investigate interactive alignment in code-switching. Below, we will describe how we applied this technique to study the role of word order and interactive alignment in code-switching.

Studying the equivalence constraint with the confederate-scripting technique

The role of word order in code-switching is most notably reflected in the equivalence constraint (e.g., Poplack 1980). This constraint states that code-switches tend to occur at sentence locations where there are no word-order conflicts between the languages involved. Earlier in this chapter, we already mentioned that Dutch has SVO, SOV, and VSO as possible word orders, whereas English only has SVO. The equivalence constraint predicts that code-switching between Dutch and English is easiest in cases where the Dutch word order is SVO. This prediction is in line with the cognitive view of bilingual language processing we discussed above, which suggests that syntactic structures that overlap between languages may cue the use of both the bilingual's languages and therefore make it easier to switch between languages.

Although evidence in favor of the equivalence constraint has been found (Deuchar 2005; Poplack 1980; Poplack & Meechan 1995), code-switches that do not adhere to the equivalence constraint have also been observed (e.g., Bentahila & Davies 1983; Berk-Seligson 1986; MacSwan 2000; Toribio 2001). Bentahila and Davies (1983), for example, came up with ten examples of code-switches that violate the equivalence constraint from a seven-and-a-half-hour long corpus of conversations containing Arabic-French code-switches. This made them conclude that "the requirement of equivalence of surface structure between the two languages does not seem to hold" (p. 319). Similarly, MacSwan (2000) argued on the basis of wellformedness judgments from two Spanish/Nahuatl code-switched sentences that "the operative principle in code switching cannot […] be Poplack's Equivalence Constraint" (p. 38).

These researchers appear to regard the equivalence constraint as an *all-or-nothing* constraint that can be falsified on the basis of counterexamples. In many psycholinguistic theories, however, this view is discarded in favor of an approach that views language processing as a process in which multiple probabilistic constraints interact (e.g., Bates & MacWhinney 1989; Seidenberg & MacDonald 1999). The equivalence constraint may well be a probabilistic constraint on code-switching, surfacing as a general tendency amenable to interaction with other forces on code-switching (see also Eppler 1999). Viewed from this perspective, the examples of Bentahila and Davies (1983) and MacSwan (2000) are not convincing enough to reject the equivalence constraint. They are single cases of code-switching that provide no information about interactions with other possible constraints on code-switching or the frequency with which these types of switching occur in comparison to switches that do adhere to the equivalence constraint. We argue that systematic research is needed in which the role of the equivalence constraint is quantifiable and examined in interaction with other regularities of code-switching in order to judge the workings of the equivalence constraint. This is exactly what we did in our study.

Our study consisted of two experiments. In the first experiment, the role of word-order equivalence in code-switching was studied in isolation from the possible influence of a dialogue partner. In the second experiment, the equivalence constraint was studied in interaction with the role of alignment with a dialogue partner.

Experiment 1: Code-switching in monologue

The first experiment was a picture-description task embedded in a sentence-completion task. Dutch-English bilinguals were asked to read aloud a Dutch or English lead-in fragment and complete these fragments by describing a picture accompanying the lead-in fragment. The lead-in fragments were included in order to prompr a particular word order in Dutch, namely SVO, SOV, or VSO:

SVO:	Een grappig plaatje, want…	//	A funny picture, because...
SOV:	Een grappig plaatje, waarop...	//	A funny picture, on which…
VSO:	Op dit plaatje...	//	On this picture…

The pictures to be described depicted simple, transitive events containing an action, actor, and a patient (so that sentences containing an S, V, and O were elicited).

In order to cue the language that the participants had to use in describing the picture, the pictures were accompanied by a color background: a red background cued the participants to use at least one Dutch word in describing the picture and a green background cued them to use at least one English word. Since the participants always had to read aloud the lead-in fragments exactly as they were, the participants had to switch languages when the language of the lead-in fragment did not match the language cued by the color background of the picture. This led to one switching condition where the word orders of Dutch and English were congruent (SVO condition), and two switching conditions where the word orders of Dutch and English were non-congruent (SOV and VSO condition). These were analyzed in terms of word order used by the participants and location of the switch.

Results revealed that, both when switching from Dutch to English and from English to Dutch, the participants always used the SVO word order when this word order was primed by the lead-in fragment. In both switching directions (from Dutch to English and from English to Dutch), the participants switched within the SVO structure (so: within the description of the pictures) as well as before the SVO structure (so: directly after having read aloud the lead-in fragment). The switching patterns were different in the conditions that primed a non-congruent word order (the SOV and VSO conditions). In these conditions, the responses depended on the switching direction: When switching from Dutch to English, the participants used a non-equivalent word order in 12% of the cases (they used SVO in the other 88% of the cases); when switching from English to Dutch, they used a non-equivalent word order in about 50% of the cases (and they used SVO in the other 50% of the cases). Moreover, in these cases where participants used a non-equivalent word order, they nearly always switched *before* beginning this word order (so they avoided switching *within* these word orders). This was not the case when they used SVO word order in these conditions, because then participants switched both within and before this word order.

In sum, the participants predominantly switched while using the (structurally equivalent) SVO word order. Moreover, while participants switched both within and before the use of this SVO word order, they were reluctant to switch within a non-equivalent word order. This dominance of SVO word order use and avoidance of switching within non-equivalent word orders clearly point to the relevance of the equivalence constraint on code-switching in this situation.

Experiment 2: Code-switching in dialogue

Having demonstrated the role of syntactic equivalence across languages in code-switching between Dutch and English outside a discourse situation, we wanted to examine how alignment with a dialogue partner interacts with these effects of syntactic equivalence. We designed a dialogue experiment in the form of a picture-matching game. Two participants were sitting on either side of a table. They both had a laptop in front of them. One of the participants was a confederate and the other participant was a 'genuine' participant who was ignorant of the fact that her partner was a confederate. The task was to take turns in describing a picture and selecting the described picture from two alternative pictures appearing on the participant's screen. Figure 2 graphically depicts the experimental set-up.

Importantly, all linguistic materials that the confederate used in describing the pictures were pre-scripted. They were systematically manipulated in terms of word order and code-switch location. Both when switching from Dutch to English and from English to Dutch, the confederate used SVO, SOV, and VSO equally often across the experiment. The word order condition of the confederate's utterance and the participant's target that directly followed it (as expressed by the lead-in fragment) were always the same. Code-switch locations were manipulated such that the confederate switched before the picture description in one-third of the cases (so directly after having read aloud the lead-in fragment) and within the picture description in two-third of the cases. The switch locations were orthogonalized with the word order used by the confederate, leading to code-switches that were in line with the equivalence constraint and code-switches that violated it.

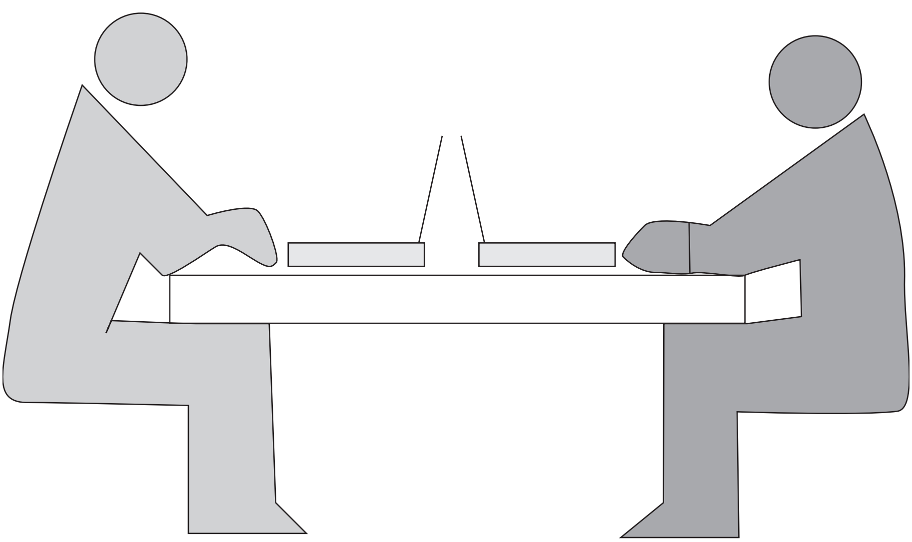

Figure 2. Set-up of the confederate-scripting technique

The items the participants had to describe were exactly the same as in Experiment 1. Based on the principles of interactive alignment, the confederate's utterances should serve as primes that affect the real participant's linguistic choices: The real participant will align her utterances with the confederate. Therefore, the question is how the confederate's utterances would affect those of the participants above and beyond the manipulations of the equivalence constraint.

It turned out that in the SVO conditions, the participants always used the SVO word order, regardless of the direction of switching. They also switched both before and within this word order. In the non-equivalent word order conditions, however, they used the non-equivalent word order in 45 % of the switches from Dutch to English, and in 75 % of the switches from English to Dutch. The location of these switches was mostly before the use of these non-equivalent word orders, though not as often as in Experiment 1. That is, as compared to the distribution of the participants' switch locations in Experiment 1, this distribution in Experiment 2 was moved slightly towards the confederate's switch locations.

Experiments 1 and 2 compared

Comparing Experiment 1 with Experiment 2, it appeared that the confederate had a strong influence on the linguistic choices made by the participants. With respect to word order, this was especially apparent in the non-equivalent word order conditions: while participants used SOV or VSO in only 12 % of the cases when switching from Dutch to English and 50 % of the cases when switching from English to Dutch in Experiment 1, in Experiment 2 they used these word orders in 45 % of the cases from Dutch to English and 75 % of the cases from English to Dutch. As the confederate always used SOV or VSO in these conditions, this must be syntactic priming effects from the confederate.

The confederate's influence was also evident with respect to the location of switching. That is, comparing the distribution of the participants' switch locations in dialogue to monologue, we found that the participants' switch locations were slightly shifted towards the confederate's switch locations. Nevertheless, most switches in a non-equivalent word order were still made before using this word order. It can be concluded, then, that the equivalence constraint was also still operational in the dialogue experiment.

The data from these experiments support the hypothesis that the equivalence constraint is present as a constraint on code-switching that can interact with other constraints, such as interactive alignment with a dialogue partner. Evidence in favor of the equivalence constraint was a general preference of the participants to use the SVO word order when switching between their languages and a tendency to avoid switching within non-congruent word orders. Evidence in favor of interactive alignment was the influence of the confederate's utterances on the participants, in terms of both code-switching location and word order. Therefore, we can conclude that the code-switching patterns of these bilinguals are affected by multiple constraints from different levels of processing.

The confederate-scripting technique as a useful technique for the study of code-switching

The study above shows how it is possible to design an experimentally controlled code-switching study that goes beyond the single-word level and is situated in a rich discourse situation. Moreover, instead of relying on either externally induced or internally generated switches, our study is a combination of the two: We forced participants to switch languages, but left the manner in which they could do so completely to themselves. As such, this methodology can have an important linking function in the range from naturalistic to experimental research techniques that Gullberg et al. (2009) suggested.

What is especially interesting about the confederate-scripted technique is its flexibility. That is, although we combined externally induced and internally generated forms of switching, this is not the only possible option. The technique can be used in tasks in which the participants are completely free to switch or not as well as in tasks in which the participants are forced to switch. Moreover, participants' responses can be measured at many different levels, ranging from on-line measures like reaction times or hesitation data to off-line measures like language choice or the linguistic structure that is used by the participants. Most interesting perhaps is that the technique offers ways to combine and manipulate independent variables from different levels of processing in a stable, parameterized situation. It is, for instance, well possible to manipulate the confederate's social identity in combination with a linguistic manipulation. Our study, which combined a linguistic manipulation (word order) with a social manipulation (dialogue partner), is an example of this point, just as the earlier discussed study by Fokke et al. (2007) who manipulated the language background and switching behavior of participants' conversation partners to examine how this affected the participants' language choice.

The confederate-scripting technique not only provides new methodological possibilities. It also constitutes a key technique to test the assumptions of the interactive alignment model. Both the dialogue situation in which the technique is used and the technique's capability to exert control over linguistic and social variables cover all aspects of the interactive alignment model. Especially when linguistic behavior is compared in dialogue and monologue, as we did, the importance of alignment and the validity of the interactive alignment model can be demonstrated. Thus, the confederate-scripting technique provides a powerful way to combine ecological validity and experimental rigor in one method, and is a fruitful technique to study interactive alignment in code-switching. Together with the theoretical framework of the interactive alignment model, it can give language researchers more insight into how social, grammatical, and cognitive forces work together in code-switching.

Conclusion

In this chapter, we proposed an interactive alignment model of code-switching and bilingual language processing. The model is based on insights from theories of discourse processing and models of language production and comprehension. It takes dialogue as its basic unit of analysis and assumes linguistic behavior to be based on alignment of representations within and between individuals. The model's specification for bilingualism assumes that the degree of co-activation of linguistic items from different languages will resonate throughout the entire processing system, resulting in the interactive alignment of language activation patterns and language choice. In this way, the interactive alignment model is capable of accounting for many phenomena of bilingual language processing and code-switching. It links social, linguistic, and cognitive forces on code-switching, which not only bridges the different approaches to code-switching that focus on these forces in isolation, but also sets a new research agenda that is specifically focused on studying the interaction of these different variables.

A promising methodological tool to embark on this research agenda and test the interactive alignment model is the confederate-scripting technique. As we have demonstrated, this is a highly flexible technique that can be used to investigate the interaction between social, grammatical, and cognitive forces on code-switching in dialogue situations. It thus forms an excellent way to testing the validity of the interactive alignment model and hypotheses on code-switching that follow from this model. The confederate-scripting technique is further capable of joining experimental rigor with ecological validity, which is a rare feature in existing research on code-switching. As such, it creates an important link between naturalistic and experimental methods in code-switching, just as the interactive alignment model forms an important link between the social, linguistic, and cognitive theoretical approaches to code-switching.

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CHAPTER 7

Language interaction as a window into bilingual cognitive architecture

Viorica Marian[1]
Northwestern University

The present chapter approaches bilingual language interaction from a psycholinguistic perspective and considers bilingual switching and transfer within the cognitive architecture of language representation and processing. Specifically, switching (overt use of words from the other language) and transfer (covert use of linguistic structures from the other language without overt switching to that language) are discussed across syntactic and semantic constraints, across lexical class (nouns, verbs), and across concrete and abstract entities. We suggest that language architecture (e.g., semantic representation, lexical access) and linguistic environment influence the nature of cross-linguistic interaction in bilinguals.

Keywords: code switching, language interaction, bilingualism, psycholinguistics, transfer, semantic representation

Introduction

> "My French and my English play with one another as two children do in a playground."
>
> (Federman, 1993)

Studying cross-linguistic interaction can provide important insights into bilingual cognitive architecture and the organization and processing of language. Existing

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psycholinguistic research suggests that a bilingual's two languages interact during both comprehension and production at the phonological (e.g., Blumenfeld & Marian, 2007; Brysbaert, Van Dyck, & Van de Poel, 1999; Dijkstra, Grainger, & van Heuven, 1999; Marian & Spivey, 2003; Spivey & Marian, 1999), orthographic (e.g., Bijeljac-Babic, Biardeau, & Grainger, 1997; Kaushanskaya & Marian, 2007; Van Heuven, Dijkstra, & Grainger, 1998), syntactic (e.g., Harrington, 1987; MacWhinney, 1987), and semantic levels (e.g., Basden et al., 1994; Snodgrass & Tsivkin, 1995).

The present chapter discusses cross-linguistic interaction during bilingual language production, focusing specifically on the psycholinguistics of bilingual switching and transfer behaviors. Although exact causes of cross-linguistic interference effects in spontaneous speech are often difficult to pinpoint, psycholinguistic studies of bilingual language processing have revealed a number of variables that are particularly relevant in switching and transfer behavior, including syntactic and semantic aspects of language, grammatical class, concreteness effects, and bilingual status. Here, we consider the constraints placed by these variables on language interference. The chapter starts with a general overview of switching and transfer behaviors, followed by discussions of syntactic effects, semantic effects, lexical category effects and concreteness effects on language interaction. In addition to these structural aspects of language, the role of linguistic environment and the speaker's language experience are considered. Finally, implications for models of bilingual language production are discussed and final conclusions are drawn at the end of the chapter.

Bringing these topics together into one paper aims to accomplish two goals. One is to help explain switching and transfer from a psycholinguistic standpoint, thus complementing the linguistic and sociolinguistic papers in this volume. The second is to contribute to the understanding of the dynamic nature of bilingual cognitive architecture. The two goals mutually complement each other – by explaining language interaction in bilingual speech we gain a better understanding of bilingual cognitive architecture, and by drawing on existing psycholinguistic knowledge of bilingualism we help advance the study of switching and transfer behavior. In essence, to understand bilingualism, one has to understand language interaction; to understand language interaction, one has to understand switching and transfer; to understand switching and transfer, one has to understand language structure and the potential constraints it may place. What follows next is therefore an attempt to contribute to this body of knowledge.

Switching and transfer

During language production, bilinguals frequently exhibit overt and covert influences from the non-target language. Overt interaction consists of switches into the other language, with bilinguals using words or phrases from the non-target language. Covert interaction consists of transfer from the non-target language without actively switching to the other language overtly; in other words, using the target language in a way that is semantically or syntactically inappropriate for the target language, but consistent with the non-target language. For example, when a Russian-English bilingual says "*he called my babushka's doorbell*" (a modified example selected from narrative data collected in our laboratory), the noun 'babushka' represents a switch to Russian to denote 'grandmother' and the inappropriate use of the verb 'called' instead of 'rang' represents a cross-linguistic transfer from Russian, where the verb '*pozvonil*' denotes both 'called' and 'rang'. Many of the errors made by bilinguals are in fact a product of language interaction and result from cross-linguistic influences of the non-target language onto the target language. (For a detailed discussion of viable definitions, distinctions, and problems with contrasting switching and transfer, see the chapter by Terence Odlin in this volume. Note also that the distinction between switching and transfer is not unlike the distinction that contact linguists make between borrowing and transfer/imposition, or between direct and indirect infusion.)

It has been suggested that cross-linguistic interaction during bilingual language production results from similarities and differences between the target language and any other language that has been previously acquired (Odlin, 1989). Language interaction in bilingual production is well documented (e.g., Gass, 1996; Jarvis & Odlin, 2000). Most studies have focused exclusively on the influence of L1 on L2, however evidence that L2 can also influence L1 is mounting (e.g., Bernardini & Schyler, 2004; Heredia & Altarriba, 2001), supporting the view that cross-linguistic influences are bi-directional (Pavlenko & Jarvis, 2002). Proposed causes of cross-linguistic interaction include lack of proficiency in the weaker language, retrieval problems, and ease of communication between bilinguals (e.g., Heredia & Altarriba, 2001), with interaction more likely in, but not limited to, a mixed language environment in which the co-activation levels of the two languages are higher.

Although linguistic influences from the non-target language are sometimes viewed as a stepping stone on the way to proficiency in the second language (Schachter, 1983), it is understood that code switching and transfer are not necessarily tied to proficiency. In fact, it seems that possibilities for transfer multiply as knowledge of L2 increases (Bhardwaj, 1986; Kellerman, 1983; Klein, 1987). Even highly proficient bilinguals can exhibit switching and transfer behaviors as a result of (a) differences in the structures of the two languages, and (b) differences in the language setting and previous experience using the two languages (including habitual switching behavior).

As far as differences in the structures of the two languages, influences of linguistic architecture on bilingual transfer and switching stem from the fact that languages vary across semantic and syntactic properties. These structural cross-linguistic differences influence the organization of the bilingual lexicon, with languages interacting either on-line via a processing-based account (e.g., both during comprehension and production, as a result of co-activation and connections between different linguistic structures, levels, and languages), and/or off-line via a representation-based account (e.g., as a result of language acquisition and concept formation). The concepts of representation and processing in psycholinguistic research on bilingualism, including in research on switching and transfer, are as important to understand as they are difficult to separate. To be precise, most phenomena observed in psycholinguistic studies of bilingualism, including reaction time and accuracy data and frequency and type of code switching and transfer data, are driven by both representational and processing differences. Delineating the individual contribution of each is often difficult, if not impossible, since differences in representation usually result in differences in processing and processing differences can alter representational features. Here, we acknowledge that both representational aspects and processing aspects play a role in the ways languages interact in a bilingual system, and our attempts to consider the two when explaining code-switching and transfer phenomena are rooted in the understanding that these are only preliminary forays into this area, with additional work to be done in the future to understand how representational and processing aspects contribute to language interaction phenomena. In general terms, the *processing*-based account suggests that the non-target language influences selection of structures in the target language during on-line lexical access. The *representation*-based account suggests that language interaction is a product of change to the mental representation. These changes are manifested when, after acquisition of a second language, second-language structures are used during first-language production (e.g., Wolff & Ventura, 2003), or when, as a result of fossilized representations acquired through the first language (e.g., Waxman, 2004), first-language structures are used during second-language production (however, note that L1 influence is only one possible cause of fossilization).

Influences of the language environment on such forms of bilingual language interaction as switching and transfer include language used at the time of speaking and, if bilinguals are describing a previous experience, the language in which the described experience originally took place (e.g., Marian & Neisser, 2000). Influences from the bilinguals' language-use experiences stem from recency of use of the two languages, previous experience using the two languages with specific topics, and variability in emotional emphasis across the two languages (e.g., Heredia & Altarriba, 2001). For example, bilinguals are more likely to switch to a non-target language if they have more experience using the non-target language with a specific topic and particular terminology associated with that topic.

Constraints on language interaction that operate on the syntactic level

Many language interaction phenomena experienced by bilinguals stem from application of syntactic rules of one language while using the other language. In an adult bilingual cognitive system, the syntax of the two languages is somewhat integrated. Shared aspects of grammar are believed to be represented in the system once and used when speaking both languages, but language-specific aspects of grammar are believed to be represented separately for two languages (e.g., Hartsuiker, Pickering, & Veltkamp, 2004). When syntactic rules differ across the two languages, syntactic expression in the target language can be influenced by the stored syntactic knowledge for the non-target language, thus yielding a detectable variance in language use. Syntactic transfers refer to constructing phrases and sentences that are grammatically deviant in the language spoken, but are consistent with the grammatical rules of the other language. These can include word order, inappropriate omission of pronouns (i.e., pro-drop), inappropriate use of determiners (i.e., *a, the*), inappropriate use of inflectional grammar (e.g., singular/plural), inappropriate use of grammatical gender, noun-verb and singular-plural agreement, etc.. Examples collected in our laboratory (Marian & Kaushanskaya, 2007) that show syntactic transfers from Russian while speaking English are provided below:

3.1. "because otherwise I was screaming" for "because otherwise, I would scream"
3.2. "I gave that essay to read to my teacher" for "I gave that essay to my teacher to read"
3.3. "I was there just with my grandmother" for "I was there with just my grandmother"
3.4. "when I first time drove" for "when I drove for the first time"
3.5. "the first what I saw" for "the first thing I saw"

In all of these cases, bilinguals use language in a way that is inappropriate for English, but is consistent with Russian morpho-syntactic rules or lexico-semantic representation.

In a recent study, Marian and Kaushanskaya (2007) collected 752 narratives from forty-seven Russian-English bilinguals and examined switching and transfer in bilingual language production. Results revealed syntactic transfers in both languages, suggesting that syntactic representations influence each other across languages during bilingual production. Syntactic transfers were more frequent when speaking the first and more-proficient language than when speaking the second and less-proficient language (e.g., Marian & Kaushanskaya, 2007), suggesting that L1 syntax may be more sensitive to cross-linguistic influence from the second language. While the exact reasons for this are unclear, three possible mechanisms may be driving the effect. The first relies on the native/non-native language distinction. Acquisition of a second-language is often tied to acquisition of new grammatical rules and the newly-acquired grammatical rules are then used in lieu of the earlier-acquired grammatical rules when speaking the native language (this is an unlikely mechanism, however, because bilinguals are generally able to differentiate the grammatical rules associated with each of their two languages and to select the grammar appropriate to the target language). The second and most likely explanation for increased syntactic transfer when speaking L1 is not tied to the native/non-native distinction, but to how specific or ambiguous the syntactic rules of the two languages are (an explanation similar to markedness constraints used in linguistics). That is, the increased likelihood of syntactic transfer is tied to the nature of grammatical rules in the two languages, with one language being more opaque and having fewer syntactic rules and the other language having more specified and detailed syntactic distinctions. These differences are not usually general across the entire language, but are localized to a specific distinction within a language; in other words, it is not that one language is more opaque overall, but rather that it is more opaque with regards to one specific linguistic distinction and relative to one specific language. For instance, whereas Russian possesses three grammatical genders for inanimate objects (feminine, masculine, neuter), English does not. Fluent Russian-English bilinguals who do not use grammatical gender or use it incorrectly when speaking Russian may do so due to decreased sensitivity to grammatical gender as a result of English use. One way to think about it is that distinctions made by the native language, but not by the second language, become more blurry than distinctions made by both languages and the more ambiguous syntactic rules of the second language influence production in the first language. The flip side of this process is that the opposite can take place when the second language has more specific distinctions than the first language. If the native language does not make a particular syntactic distinction and the second language does, acquiring these distinctions during second language learning may also alter syntactic processing in the first language. For example, if the native language relies on free word order and the second language places specific constraints on word order, it is likely that the L2 word order constraints become applied when using the native language as well. However, these transfers of word order constraints may be difficult to detect because they are grammatically correct in the language that allows free word order. To detect transfers from a language that is syntactically more ambiguous into a language that is syntactically less ambiguous, researchers would have to examine rates of use of specific word order patterns in monolingual speakers and compare them to rates of use of the same word order patterns in bilingual speakers who acquired a syntactically less ambiguous language. In sum, a detectable syntactic transfer may be especially likely to take place when speaking a language in which syntactic rules are more specified and may be less likely when speaking a language with more lax/ambiguous syntactic rules. This explanation is similar to the markedness constraints concept used in linguistics, as well as to the constraints described in the Competition Model proposed by MacWhinney and colleagues (e.g., MacWhinney, 2005, 1987). Finally, a third potential explanation is closely tied to proficiency levels across the two languages, with syntactic transfer more likely when speaking a less proficient language than when speaking a more proficient language. The role of proficiency in patterns of language interaction is discussed in more detail later.

Constraints on language interaction that operate on the semantic level

In bilinguals, the semantic systems pertaining to the two languages appear to be integrated, with concepts shared across both languages (e.g., Basden, Bonilla-Meeks, & Basden, 1994; Snodgrass & Tsivkin, 1995). Yet, concepts may be viewed as sums of multiple features (De Groot, 1989) and even concepts that are shared for the most part may include features that are unique to each language. Because different languages may conceptualize the same notion in different ways (e.g., Boroditsky, Schmidt, & Phillips, 2002; Bowerman & Choi, 2001; Gumperz & Levinson, 1996), the semantic representations in bilinguals may remain somewhat distinct for the two languages. That is, while lexical translation equivalents share many conceptual features, they do not always share all of them (Van Hell & de Groot, 1998a). Activation of a lexical item activates all conceptual features associated with it, including those that are idiosyncratic to the non-target language. Therefore, preparation of a message in a target language includes activation of both shared and idiosyncratic features, co-activating the lexical item in the non-target language, a hypothesis confirmed by empirical evidence (e.g., Colome, 2001; Costa, Miozzo, & Caramazza, 1999). When parallel activation of a lexical item in the non-target language entails a meaning not subsumed by the target language, cross-linguistic switching or transfer may occur.

Marian and Kaushanskaya (2007) found more lexical/semantic transfers when speaking the second language than when speaking the first language. Finding more lexical/semantic transfers when speaking the second and less proficient language is consistent with previous results that transfer is more prevalent when speaking a lower-proficiency language (e.g., Döpke, 1992). Although semantic transfer can and does take place when speaking the native language, the finding that it is more frequent when speaking the second language suggests that L1 semantic representations may be more stable and more likely to transfer relative to L2 semantic representations. Further, the pattern of results obtained for semantic transfer differs from the pattern of results obtained for syntactic transfers, suggesting that the two may be differentially susceptible to cross-linguistic influences. Specifically, L1 syntax may be more sensitive to cross-linguistic influence than L1 concepts, with L1 syntactic structures more malleable than conceptual representations acquired during first-language acquisition. Conversely, L2 conceptual representations are more likely to be influenced by L1 concepts, but L2 syntax is more likely to seep into L1 use. In other words, it may be that early acquisition may be more important for strength of conceptual representation, while recency may be more important for syntactic strength.

Examples of semantic transfers from Russian while speaking English are provided below:

4.1 "ordered a song for me" for "requested a song for me" – here, the verb *requested* has been replaced with the verb *ordered* because in Russian the same verb is used to refer to both, suggesting that the conceptual representation for 'ordered' and 'requested' may be somewhat different and potentially more fused for Russian-English bilinguals relative to English monolinguals.

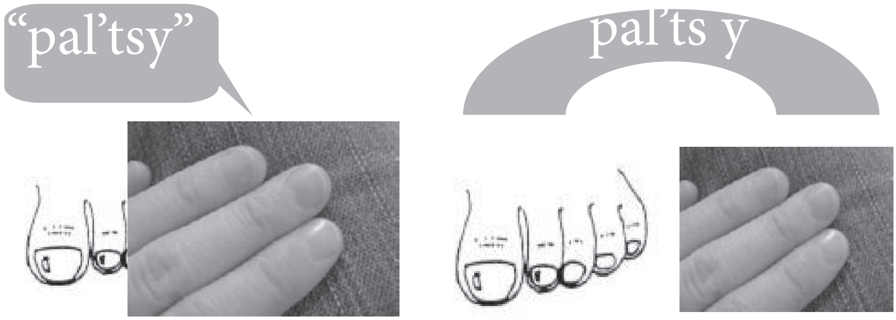
4.2 "somewhere under Rome" for "somewhere near Rome" – here, the spatial representation of Russian-English bilinguals may be different from that of English monolinguals as illustrated by the fact that in Russian the locative preposition *under* is used to denote the location of any suburb or smaller town relative to a big city, while in English *under* is used to denote a location that is typically below an item only.

4.3 "she left into the second grade" for "she left during the second grade" – here, the preposition *into* is used incorrectly instead of the preposition *during* due to differences in ways Russian and English express motion and duration, specifically due to differences in ways in which the prepositions *in*, *into*, and *during* are used.

Moreover, some transfers, such as the transfer "trip in the wood," include both grammatical (morphological) and semantic components. Here, in terms of morphology, inflectional grammar was used incorrectly, singular 'wood' should have been plural 'woods.' In terms of conceptual representation, in Russian the noun for 'woods' is singular (*lyes*). A bilingual Russian-English speaker therefore uses inflectional grammar incorrectly probably because his or her conceptual representation of the word may be different from that of a speaker for whom the word 'woods' is in plural form. It is quite possible that Russian speakers represent the concept of woods more as a holistic entity (as one thing, one unit), or at least more so than English speakers. In other words, the observed transfer, although grammatical in nature, may stem from representational differences associated with the fact that in Russian the corresponding translation equivalent is a lexical word in singular form. For example, a bilingual who has no difficulties distinguishing between the words *finger* and *toe* when hearing them in English, but who consistently makes production errors in which *toes* are labeled *fingers* is likely influenced by the lexico-semantic representations of the first language in which no lexical distinction between the two is made and the same word is used to refer to both (as is the case for Russian or Romanian, for instance). This is not to say that Russian-English or Romanian-English bilinguals do not know the difference between the two – they are perfectly able to distinguish toes and fingers; rather, it suggests that their mental representations of *fingers* and *toes* may be less delineated than in speakers of languages that use distinct lexical units for the two words. Such production errors are a result of cross-linguistic transfer that may be due to fused conceptual representations (thus a representation-based account) or to parallel activation during lexical access (thus a processing-based account). They are also likely tied to frequency of use and have been suggested to sometimes lead to the attrition of one of the lexical labels in the semantically divergent pair of concepts (Isurin, 2000). The two possible mechanisms are represented graphically in Figure 1.

Additional research will need to explore whether such transfers are due to changes to the semantic representation or to parallel activation and interference of the non-target language during lexical access. It is possible that transfers that are rooted in representational differences are more likely to be produced consistently (at least until the conceptual representations undergo further changes), while transfers that are rooted in processing differences are more likely to be produced only some of the time. However, it is difficult to disambiguate language-interaction effects from deficiencies of knowledge, since transfers that are rooted in conceptual melding of the two languages are likely to be produced repeatedly. Future research would have to either document knowledge acquisition longitudinally or target specific structures experimentally for evidence of correct use.

Conceptual Representation Pathway (Off-Line) | **Lexical Access Pathway (On-Line)**



Because Russian denotes fingers and toes using the same word, their representation at the conceptual level is fused together and less delineated (above), resulting in using the same lexical item when referring to either in English (below). The item whose representation is stronger due to a larger associative network is used

Although conceptual representations for fingers and toes are separate (above), one Russian word translates onto two English words and the more frequent translation equivalent is selected during lexical access (below).

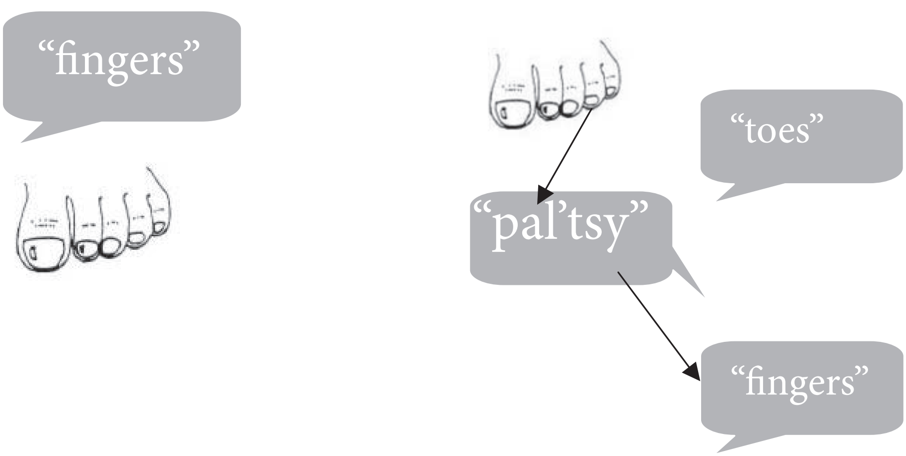


Figure 1. A graphical representation of the two possible mechanisms driving cross-linguistic transfer in bilinguals. Each of these mechanisms may operate independently, or the two may act together, to produce cross-linguistic interaction during production

Constraints on language interaction that operate on the level of lexical category

Given that differences in semantic and syntactic representations drive language interaction, any systematic variability in organization of the lexicon may then manifest itself in switching behavior. One of the main organizing principles of conceptual and syntactic representations relies on differences between grammatical categories, most notably between nouns and verbs. Previous studies have shown that nouns and verbs differ in a number of ways; for instance, nouns depict entities, which can often be identified by a set of sensory properties, while verbs depict relations between entities and are more difficult to define by sensory properties (Gentner 1981, 1982; Joanette & Goulet, 1991; Paivio, 1986; Zingeser & Berndt, 1990). Moreover, actions and relations, which are expressed by verbs, are encoded by other grammatical categories as well, and vary more drastically across languages (Gentner, 1981, 1982; Slobin, 1996). We know that nouns are generally acquired earlier than verbs (at least in English, e.g., Bates et al., 1994; Choi, 1997; Gentner, 1982; Nelson, 1973), are easier to access than verbs (e.g., De Bleser & Kauschke, 2003), and are more tied to real-world referents than verbs (e.g., Gentner, 1981, 1982).

Consistent with these differences between nouns and verbs in monolinguals, the two grammatical categories also show different organizational patterns in the bilingual lexicon. Using a bilingual word-association task, Van Hell and de Groot (1998a) found that nouns elicited more similar responses and shorter reaction times across languages than verbs, suggesting that verbs may be represented in language-specific conceptual stores, while conceptual representations for nouns may be more integrated in the bilingual lexicon. Further, it has been suggested that memory for nouns is superior to memory for verbs (Earles & Kersten, 2000; Engelkamp, Zimmer, & Mohr, 1990; Kintsch, 2001) and that memory for verbs is more dependent on reinstating the linguistic context of the original encoding than memory for nouns (Kersten & Earles, 2004). Because fluent bilinguals switch between languages, the changing linguistic context may influence encoding of nouns and verbs, and may result in different cross-linguistic interaction patterns for the two grammatical classes. Specifically, because verbs are more tied to a specific linguistic context, nouns may be more "portable" across languages and contexts, as a result verb-encoding may be more influenced by language change than noun-encoding. (Note that in addition to the meaning part of the lemma, the syntactic part likely plays an important role in generating the difference between nouns and verbs as well.)

Empirical research supports these predictions. Studies on language switching suggest that switches occur more frequently on nouns than on verbs (e.g., Angermeyer, 2002; Joshi, 1985; Myers-Scotton, 1993). For transfer, both noun transfer (e.g., Jarvis & Odlin, 2000; Pavlenko & Jarvis, 2000) and verb transfer (e.g., Helms-Park, 2001; Wolff & Ventura, 2003) have been doumented. For example, Marian and Kaushanskaya (2007) found different patterns of language interaction for nouns than for verbs: Verbs were subject to covert cross-linguistic transfer more than nouns (227 instances or 0.53% for verbs vs. 79 instances or 0.17% for nouns, $p < 0.05$), but nouns were subject to overt cross-linguistic switches more than verbs (23 instances or 0.24% for nouns vs. 3 instances or 0.03% for verbs, $p < 0.05$). Such findings reinforce existing knowledge about the organization of the bilingual lexicon, as well as existing knowledge about processing differences between nouns and verbs. In the bilingual lexicon, nouns are more likely to be integrated across the two languages, and verbs are more likely to be represented in language-specific conceptual stores (Van Hell & de Groot, 1998a). In addition, verb meanings (e.g., action, motion, etc.), by virtue of being encoded by additional grammatical categories (or arguments within the verb phrase), are more tightly interconnected within a sentence, making them more difficult to switch as single words intra-sententially (e.g., Joshi, 1985; Myers-Scotton, 1993). Therefore, language interaction that takes place at the lexical level influences nouns more than verbs (since nouns are more integrated conceptually and easier to access lexically) and language interaction that takes place at the conceptual level influences verbs more than nouns (since verbs are more distinct conceptually and are more connected within a sentence). It is therefore not surprising that more switches take place for nouns and more transfers take place for verbs.

The findings that switching is more prevalent for nouns than for verbs is consistent with Muysken's (2001) hierarchy of borrowability. A similar hierarchy for transfer has yet to be developed, with future research needed to compare and contrast patterns of switching and transfer for adjectives, adverbs, function words, and so on. It is likely, for instance, that closed class words (such as prepositions, determiners, modifiers, and complementizers) are more prone to transfer than to switching. Open class words (such as nouns, verbs, adjectives, adverbs), on the other hand, may vary in the direction of the difference depending upon their relation to other grammatical categories, representational and processing differences, and acquisition patterns. For example, adjectives may mirror the patterns observed for nouns, while adverbs may mirror patterns observed for verbs. These theory-driven hypotheses need to be tested empirically, requiring extensive samples of bilingual speech with copious instances of language interaction to be analyzed statistically in future studies.

Constraints on language interaction that operate on the concreteness level

Within each grammatical class, some nouns and verbs are more concrete than others. For example, nouns referring to imageable concepts (e.g., *apple*) are more concrete than nouns referring to unimageable concepts (e.g., *peace*). Similarly, verbs referring to highly-imageable actions (e.g., *jumped*) are more "concrete" than verbs referring to feelings or states (e.g., *felt*). Concreteness has been found to facilitate noun acquisition and processing so that concrete nouns are more easily acquired by children (e.g., Brown, 1957; Gentner, 1982), and are recognized and processed more rapidly by adults (e.g., Kroll & Merves, 1986; Paivio, 1971; Strain, Patterson & Seidenberg, 1995). Schwanenflugel and Shoben (1983) suggested that concrete words rely on greater availability and greater processing ease than abstract words, and Plaut and Shallice (1991) suggested that processing of concrete words is supported by more semantic features than processing of abstract words. In studies with bilinguals, concrete nouns were translated faster than abstract nouns (e.g., De Groot, Dannenburg, & Van Hell, 1994; Van Hell & De Groot, 1998b), and showed more reliable cross-linguistic priming effects than abstract nouns (e.g., Jin, 1990; Paivio, Clark, & Lambert, 1988). Van Hell and De Groot (1998b) suggested that meanings of concrete translation equivalents share more features, while features of abstract translation pairs may be more language-specific. Moreover, meanings of abstract translation equivalents may be less similar than meanings of concrete translation equivalents (e.g., Taylor, 1976), and may depend more on linguistic context than concrete words (e.g., Breeding, Saffran, & Coslett, 1994).

Just as processing of nouns is influenced by concreteness, so is processing of verbs influenced by the degree to which a verb is tied to its perceptual referent. For example, verbs of motion such as *ran* and *walked* are likely to be more concrete, while state verbs such as *liked* and *imagined* are likely to be more abstract. Action and state verbs have been found to be processed differently in bilingual contexts, with classification of motion verbs taking longer than classification of state verbs in the first language, but not in the second language, possibly due to greater interconnectivity of verbs in the first language compared to the second language (Segalowitz & De Almeida, 1992). Moreover, languages differ in how they encode verbs (Slobin, 2003), especially action verbs of motion, such as "walked" (Talmy, 1975, 1985, 2000). For example, unlike English, Russian has an extensive prefixial system that encodes the direction of action. A Russian-English bilingual who says "come to the house" instead of "come into the house" is likely adapting the Russian verb-framed system (instead of the English satellite-framed system), in which the same preposition '*v*' would be used to denote both *to* and *into*, and the difference would be marked with a prefix before the verb 'come' (*prishel v dom* versus *voshel v dom*, where the prefix "pri" signifies movement toward and the prefix "vo" signifies movement inward). The lack of difference between the two prepositions in Russian is transferred to the use of preposition in English, with the speaker transferring the assumption that motion direction is encoded within the verb. Use of the Russian verb-framed system (where direction information is encoded within the verb by changing the prefix) while speaking English is an example of grammatical transfer resulting from grammatical differences between the two languages.

Marian and Kaushanskaya (2007) found more transfers for concrete than for abstract nouns and more transfers for action verbs than for state verbs (the relatively low number of noun and verb switches did not permit meaningful statistical analyses of switching rates between concrete versus abstract nouns and verbs). The higher number of transfers for action verbs could be due to the variable nature of representations for relations across languages, the high susceptibility of relational terms to language influences, and the differences in motion verb encodings across languages. Another mechanism driving transfers for action verbs may rely on the nature of L2 learning, with L2 words often learned in a linguistic context (either in a classroom setting or by forming translation equivalents, as opposed to matching entity to word during language acquisition in the real world). In a study of adult language learning, Gillette et al. (1999) found that adults learning words from a linguistic context (e.g., written sentences) acquired action verbs with more difficulty than state verbs. If action verbs are learned with more difficulty than state verbs in linguistic contexts, and if much of adult second-language learning takes place in a linguistic context, then it is not surprising that action verbs are more susceptible to transfer. Although this does not explain the pattern in the first language, it is likely acting as part of a cumulative mechanism that relies primarily on cross-linguistic interconnectedness for concrete nouns and verbs. The converging patterns of concreteness effects across nouns and verbs suggest that the concreteness constraint acts similarly on different grammatical categories.

It is feasible to suggest that concreteness effects and lexical category effects may act at different levels in the processing stream. Conceptual differences between nouns and verbs (verbs are represented in more language-specific ways, etc.) may make verbs more susceptible to cross-linguistic influences stemming from semantic representation. In other words, because differences between verbs across languages are postulated to be at the level of semantic representation, cross-linguistic influences are expected to stem from the semantic representation level for verbs. Meanwhile, because concrete nouns (and action verbs) are more integrated in the bilingual lexicon than abstract nouns (and state verbs), translation equivalents and their semantic neighbors are more likely to be co-activated during production of concrete items than during production of abstract items (e.g., Van Hell & De Groot, 1998b). Co-activation of non-target language translation equivalents for concrete entities may make them more vulnerable to processing-based transfer. Thus, it is possible that concreteness effects are more likely to act at the lexical level, while word-class effects (verbs vs. nouns) are more likely to draw upon the representational level, in addition to the lexical level. Noun/verb effects may be a result of representational differences between the two grammatical classes, while concreteness/abstractness effects may be a result of processing differences in activation patterns. However, boundaries between conceptual and lexical representations have yet to be clearly defined (e.g., although lemma access is not typically considered to take place at the level of semantic representation, its exact placement and even its very existence as a bona-fide level continues to be debated), making discussions of grammatical classes and concreteness effects at different levels in the processing stream very preliminary and in need of further empirical research.

Finally, there are two other possible methodological factors that are contributing to finding a greater number of transfers for concrete vs. abstract nouns. One is the number of synonyms available--since concrete words tend to have fewer synonyms than abstract words, it could be more difficult to detect the transfer of an abstract concept. In the same vein, transfer of state verbs may be more difficult to detect, due to greater flexibility in ways of expressing mental states than in ways of expressing actions and motions. The other methodological factor is the number of possible translations that concrete and abstract words may have. For example, Tokowicz and Kroll (2007) found that the number of translation equivalents and the associated ambiguity influence within and across-language processing. Future research will need to examine empirically how the number of synonyms and the number of translation equivalents a word has influence patterns of language interaction.

Role of language environment and language experience

As mentioned in the introduction, in addition to the structure of the two languages, patterns of language interaction can also be impacted by language environment and the bilingual's previous language experience. (For a thorough review of the literature on the role of language environment and bilinguals' language history in patterns of language interaction in bilinguals, see the Altarriba chapter in the present volume.) Interestingly, the effect of language experience on language interaction has been found to vary across the two types of cross-linguistic influence, with switches and transfers showing different patterns. Marian and Kaushanskaya (2007) found that bilinguals were more likely to switch when speaking their first and more proficient language, a result consistent with previously reported code-switching patterns in bilinguals (Heredia & Altarriba, 2001). The pattern of language transfer differed from the pattern of code switching in that more transfers were observed when speaking the second and less proficient language. The bilinguals tested in the Marian and Kaushanskaya (2007) study were college students in the USA who grew up speaking Russian in the former Soviet Union and immigrated to the United States in their early teens. They acquired their second language in the USA and were highly proficient in both languages at the time of testing. While most of the bilinguals tested indicated that L2 was their preferred language, they were rated as more proficient in their L1 than in their L2 by independent bilingual coders (based on error rates, disfluencies, accent, etc.). Whether or not the results obtained from that study can be generalized to other bilingual populations, and how the patterns may differ for bilinguals whose second language is the more proficient language, are questions for future research.

In addition to effects of proficiency, switching and transfer may also be driven to some extent by accessibility and sociolinguistic factors such as linguistic context, language status, etc.. It is possible that the bilinguals in Marian and Kaushanskaya's study borrowed more English words when speaking Russian because English was the language of the immediate surrounding environment (the campus of an American university). The immediate linguistic environment may have influenced the frequency of use and relative status of English, causing higher activation of English lexical items. An alternative explanation is rooted in acquisition patterns. Switching may be more frequent when speaking Russian because some of the concepts that have been acquired in an English-speaking environment had no equivalents in Russian when the speaker lived in a Russian-language environment. Although labels have since become available in Russian and are known to the bilingual, the English labels continue to be used as a result of acquisition order and previous experience using one, but not the other, label. It is likely that bilinguals with different proficiency levels in their two languages, with different language history backgrounds, or in a different linguistic setting would show different patterns of cross-linguistic influence. Separating out the individual contributions of proficiency, order of acquisition, and specific language is often difficult. Moreover, sociolinguistic factors such as language status, prestige/stigma associated with a language and the local production context may also impact language interaction. For instance, the number of switches would likely decrease if participants were interviewed by monolingual speakers of the two languages and would likely increase if participants were interviewed by a bilingual who habitually switched between the two languages. Such differences would only be observed for language interactions that result from on-line interference, but not for those that stem from modification of the conceptual representation. In general, the influence of perception on code switching in production is only at early stages of investigation (but see Kootstra & van Hell, this volume).

An interesting finding in Marian and Kaushanskaya's 2007 study is that bilinguals switch more when speaking about an event that took place in the other language. For example, when a bilingual speaking in Russian used the English word 'apartment' instead of the Russian word 'kvartira' when talking about finding an apartment upon their arrival to the US ("*nashli apartment*"), what contributed to this switch was likely the fact that English was being spoken (including the actual use of the English word 'apartment') when the original event took place. That is, when speaking Russian, bilinguals were more likely to switch to English if talking about an event during which English was used than if talking about an event during which Russian was used. This increase in switching behavior when there was a mismatch between the languages of encoding and retrieval is consistent with the language-dependent memory hypothesis (Marian & Neisser, 2000), which suggests that accessibility of information is influenced by the match between the language used during retrieval and the language used during the encoding of that information (e.g., Marian & Fausey, 2006; Marian & Kaushanskaya, 2007 b). It is also consistent with findings of increased likelihood of switching if the switched item was previously used in the non-target language (Angermeyer, 2002). Unlike frequency of switching, frequency of transfer was not influenced by language of encoding at the time of the event, suggesting that transfer may be subject to changes in the linguistic environment to a lesser extent than switching. Instead, transfer may be influenced more by linguistic architecture, including representational differences. Switching and transfer likely differ in the degree to which they are episodic, with transfer and syntactic processing less tied to a specific occurrence.

Implications for models of bilingual language processing

Models of bilingual language processing incorporate control mechanisms into their frameworks to different degrees. While some postulate top-down mechanisms in deactivating the non-target language when speaking the target language (e.g., Green, 1986; 1998), others suggest that different activation thresholds for target and non-target lexical items account for language selection during comprehension (e.g., Thomas & Van Heuven, 2005; Van Heuven, 2000). Figure 2 shows a graphical representation of the likely loci of switching and transfer in bilingual language production and suggests that, in addition to overlapping loci of switching and transfer at the lexicon/lemma/wordform level, transfer (at least, semantic transfer) is more likely to stem from underlying conceptual representation differences between languages, while switching is more likely to be due to control mechanisms during lexical selection (either as a result of failure to inhibit the inappropriate lexical unit or due to its higher activation without the explicit use of suppression). However, although the lexicon (as opposed to semantic and conceptual representation) is more often the locus of switching, while the conceptual store is more often the locus of transfer, the actual language interaction system is more complex, allowing switching and transfer to happen at both the lexical and the conceptual levels (note that code switching at the clausal/sentential level was not the focus of the present work). For example, switching may take place at the. conceptual level if a lexical item does not have a representational equivalent in the

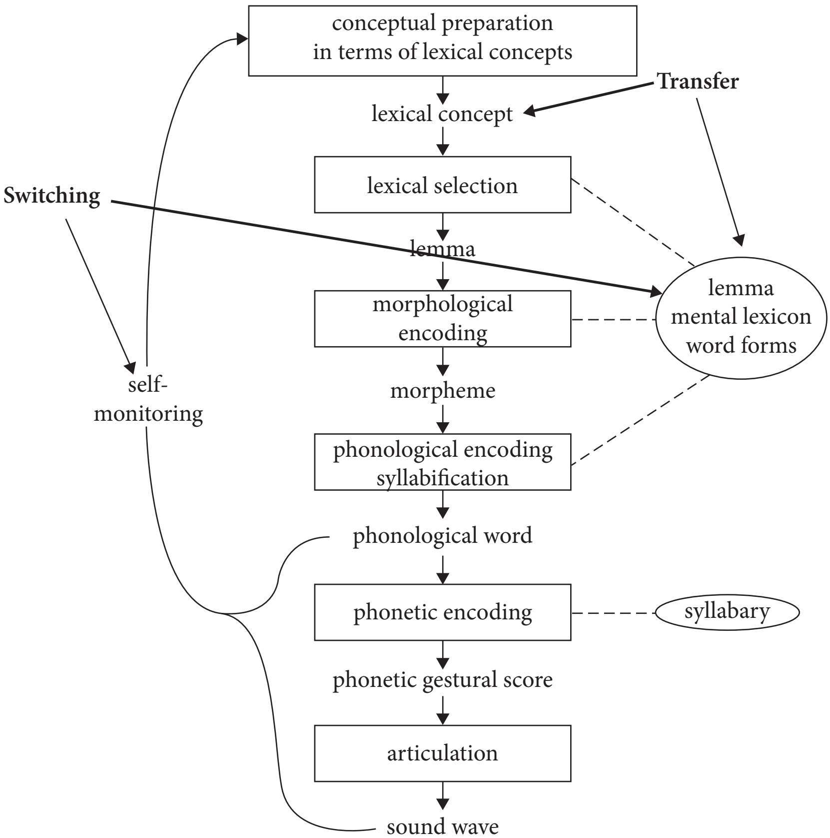


Figure 2. A graphical representation of the Levelt (1999) model of bilingual language production showing a proposal for potential loci of transfer and switching behaviors

other language. In fact, in cases in which there is no lexical concept for a lemma to match with, the boundaries between lexical and semantic are further blurred, with both likely to play a role. Similarly, transfer may include the lexical level when the underlying representations are highly imageable and include numerous overlapping features, as is the case for concrete nouns and action verbs

An on-line control mechanism that can inhibit interference of the non-target language during target-language production would have a stronger influence at the lexical level than at the conceptual level (given the more integrated conceptual system). Accordingly, models of language processing that include inhibitory control mechanisms typically propose that these mechanisms act at the lexical level. It is hereby proposed that a control mechanism would therefore influence switching more than transfer, resulting in higher rates of transfer than switching in situations in which bilinguals are consciously attempting to communicate in one language only and to control language output. This hypothesis is consistent with findings that bilinguals are able to exert more control over switching than over transfer, with covert interactions more frequent than overt ones, and is in line with linguistic views that there are stronger constraints on borrowing than on transfer/imposition. Moreover, an asymmetry in the control mechanism is possible across the two languages and this asymmetry is likely reinforced by previous experiences. For example, more switches are likely when speaking L1 if the proportion of time bilinguals are able to switch into L2 when speaking L1 is greater than the proportion of time bilinguals are able to switch into L1 when speaking L2. This is precisely the case with many proficient bilinguals in the United States whose second language is English -- most of their L1-speaking interlocutors in the US also speak at least some English (making switching into L2 feasible), however not all of their English-speaking interlocutors also know the L1 (making switching into L1 while speaking English often not possible). This suggested asymmetry is also consistent with the Inhibitory Control Model (Green, 1998) and with empirical findings that switching costs are higher when speaking L2 and switching to L1 than when speaking L1 and switching to L2 (e.g., Meuter & Allport, 1999). Therefore, switches would be more likely when speaking L1 because it is typically easier for unbalanced bilinguals to inhibit L2 after it has been activated; in other words, a switch into L2 would produce less unwanted L2 interference subsequent to the switch than a switch into L1 while speaking L2 would. For a review of the literature on switching costs, see the chapter by Renata Meuter in this volume.

Finally, a control mechanism may also influence lexical category constraints (likely due to differences in semantic representation), as well as level of concreteness constraints (likely during lexical selection). Specifically, recall the earlier inference that level of concreteness exerts constraints on-line, during selection, while lexical category exerts constraints off-line, at the level of semantic representations. If a control mechanism influences concreteness constraints more than lexical category constraints, then differences between nouns and verbs should remain regardless of the degree to which a control mechanism is involved during language production. Differences between concrete and abstract entities may be more susceptible to control mechanisms, with abstract nouns being more sensitive to control mechanisms than concrete nouns and with state verbs being more sensitive to control mechanisms than action verbs. Future studies can further test these hypotheses.

Conclusions

To conclude, the bilingual language system is highly interactive at all levels of the cognitive system, including lexical access and semantic representation, with processing in one language influenced by knowledge of another language. Cross-linguistic interactions during production appear to be influenced by the architecture of the two languages and by differences in linguistic structures in semantics, grammar, lexical category, and degree of concreteness, as well as by differences in language environment (at the time of speaking and at the time when the content was formed) and previous language experience (recency of language use and proficiency in the two languages). Different patterns of cross-linguistic interaction can be observed for overt switching compared to covert transfer. For example, transfers appear to be more resistant to control mechanisms than switches, switches appear to be more common for nouns than for verbs, transfers appear to be more common for verbs than for nouns, concrete entities appear to be transferred more than abstract entities, and bilinguals are more likely to switch (but not to transfer) when describing an event that originally took place in the non-target language (Marian and Kaushanskaya, 2007). The different effects of language architecture and language environment on switching vs. transfer suggest that the two types of cross-linguistic interaction may take place at different levels of cognitive processing. Switching may be rooted in lexical access phenomena, and transfer may be rooted in representational/conceptual phenomena, although this dichotomy is not absolute and both representational and processing differences can contribute to the two types of language interaction. Future research will need to focus on disambiguating the representational-based and the processing-based accounts, for example by targeting specific linguistic phenomena such as word frequency and polysemy – with word frequency effects most likely due to differences in lexical access and polysemy effects most likely due to differences in mental representation.

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Sociolinguistic and linguistic studies

CHAPTER 8

Trying to hit a moving target

On the sociophonetics of code-switching

Barbara E. Bullock and Almeida Jacqueline Toribio
The University of Texas, Austin

In this chapter we examine the phonetic reflexes of code-switching in bilingual production. We demonstrate that, in code-switching, bilinguals maintain distinct phonological categories for voiceless stops with respect to the Voice Onset Time (VOT) variable, but their speech may manifest various interlingual effects at the level of phonetic implementation, including divergence, convergence, hyper-articulation, and transfer. We argue that this diversity of outcomes reflects normal variation and that the specific phonetic result of code-switching may be characterized by appeal to linguistic-internal factors (i.e., inherent differences between the contributing languages) and linguistic-external factors (e.g., proficiency, language practices, perceptions of congruence).

Keywords: code switching, phonology, voice onset time, variation, transfer

Introduction

Of all of the various forms of bilingual linguistic behavior, code-switching (henceforth, CS) is the most evident and immediate declaration of a speaker's bilingualism. For many researchers, CS provides direct insights into the ability of bilinguals to manage and to deploy different linguistic systems even while alternating between them. This ability arises from a confluence of cognitive, linguistic, and social factors, each of which is normally studied independently of the other. Cognitive approaches generally focus on CS as an index of a bilingual's ability to selectively inhibit or activate a language. Linguistic approaches, in turn, aim to discern the knowledge of language that bilinguals must possess to enable them to switch between the two systems in systematic ways. Finally, sociolinguists explore why and under what conditions bilinguals may choose to code-switch. Although each discipline necessarily employs different methods of inquiry and analysis, common to all approaches is a focus on what bilinguals do *with* their languages when code-switching, where each language is understood to be a relatively static entity. But much more rare in the vast literature on CS is the acknowledgement that bilinguals may actually do something *to* their languages when code-switching. That is, that the structures produced when bilinguals engage in CS may reflect small but significant linguistic changes relative to their own monolingual productions.

The focus of this investigation is on the phonetic production of bilinguals, an area that has been neglected in linguistic and sociolinguistic approaches to the study of CS, which tend to focus exclusively on the position of a code-switch with respect to higher order linguistics domains such as morpho-syntactic constituents or pragmatic-discursive components. The lack of attention to the phonological repercussions of CS may ensue from the traditional division between borrowing and CS. The former is generally assumed to involve the phonological adaptation of words from the source language into the lexicon of the recipient language, whereas CS, which occurs spontaneously, does not. Thus, only borrowings are assumed to be instructive about cross-linguistic phonological perception and production. Code-switches, on the other hand, arguably affect only the low-level phonetic properties of the sound system and, even then, only as temporary perturbations. Yet, as psycholinguists have recognized, the low-level, gradient nature of phonetics can offer insights into how bilinguals process and produce in two languages that differ along a given acoustic-phonetic dimension. Moreover, sociolinguists, working largely on monolingual or bi-dialectal communities, have consistently documented the relation between phonetic variation and factors such as social status, group identity, speech register, etc., an enterprise referred to as *sociophonetics* (see Thomas 2002 for an overview).

The present work spans the void between the psycholinguistic research on language switching and the knowledge gleaned from sociophonetics. We argue that the component languages of a bilingual engaged in CS should not be expected to be invariable, monolingual-like systems but, instead, these languages – used independently or in conjunction, as in CS – can provide us with evidence of a rich repertoire of bilingual forms. Moreover, we argue that the variable outcomes produced by bilinguals are probably not reducible just to differences in proficiency or language dominance. Rather, CS data reflects various sociophonetic strategies that bilinguals have at their disposal to maintain contrast between their languages while, at the same time, articulating them together. A speaker's language proficiency, metalinguistic knowledge, and language socialization all likely contribute to the selection of strategies he or she employs when engaged in CS.

Psycholinguistic studies

Psycholinguists, focusing on the underlying cognitive mechanisms and neural organization responsible for bilingual speech, have conducted numerous experiments under the rubric of *language switching* (see Kutas et al., 2009, for an overview). Language switching tasks require participants to change their language of response at a predestined point in the utterance. They are designed to allow researchers to assess whether or not there is a cognitive 'cost' to language alternation in terms of response times. In the phonetic realm, language switching research generally seeks to determine whether the language of presentation, termed the *base* or *precursor language*, affects the perception or production of the response or *guest language*.

To date, nearly all phonetic switching studies use stimuli that probe the phonetic categorization of the voiced /b, d, g/ versus voiceless /p, t, k/ series of stops (see Bullock 2009, for an overview). One important acoustic cue for distinguishing between these series of stops is Voice Onset Time (VOT), defined as the interval, measured in milliseconds, between the burst release of the consonant closure and the onset of voicing in the following vowel. VOT spans a continuum, and languages vary according to where they place the transition point between stops that are perceived to be voiced versus those perceived to be voiceless. For instance, Spanish voiceless stops are produced with a short voicing lag (averaging ~ 0–30 ms.) while English voiceless stops are produced with a long lag (averaging ~ 30–120 ms.), which often creates a perceptible period of aspiration. However, there is good deal of variation in the production of voiceless stops in each language so that there are points along the continuum at which the languages may overlap. The gradient nature of the voicing lag for voiceless stops makes it an ideal testing ground for examining whether or not the component languages of a bilingual can be seen to interact and influence each other in CS.

Imagine what a Spanish-English bilingual must do to articulate a sentence such as (1), in which the voiceless stops are underlined:

(1) I will <u>c</u>all *<u>T</u>ía <u>C</u>armen mañana.*
'... Aunt Carmen tomorrow.'

Each stop potentially presents a broad range of target VOTs, although the range itself differs between the two languages. Essentially, the target phoneme, /k/, is the 'same' category across languages, but its articulation ideally represents a language-specific distinction. That is, the initial /k/ of English "call" should be produced within the appropriate range for English, while the initial /k/ of Spanish "Carmen" needs to be produced within the respective Spanish range. Significantly, those ranges could, at times, overlap. While code-switching, then, a bilingual needs to hit a moving a target from the phonetic point of view.

A number of distinct phonetic outcomes of the bilingual's behavior while engaged in CS can be envisioned (relative to his or her behavior when not code-switching.)

i. There is no change in one or both languages. That is, the respective average VOT for /k/ in one or both languages remains the same, indicating that the speaker code-switches immediately and completely at the phonetic level in one or both directions.
ii. The respective average VOT for /k/ in one or both languages merges toward that of the other, indicating that there is some degree of cross-linguistic assimilation.
iii. The respective average VOT for /k/ in one or both languages moves away from that of the other, indicating that there is some degree of cross-linguistic dissimilation.

On this view, a range of inter-systemic influences on CS is possible. Under scenario (i), CS has no effect on phonetic production in one or both languages. That is, the bilingual is able to maintain monolingual-like values while switching, indicating a fine degree of articulatory control. Scenarios (ii) and (iii) indicate that CS does have an effect on phonetic production, either drawing the languages closer together from a phonetic perspective (ii) or moving them apart (iii). Scenario (ii), in particular, potentially allows for a complete neutralization of VOT across languages, where a bilingual could collapse the VOT distinction across languages into a single phonetic category.

In large part, the psycholinguistic literature on the phonetics of language switching is focused on the effect of the base language on the perception of the guest language (Caramazza et al. 1973, Williams 1977, Elman et al. 1977, Soares & Grosjean 1984, Grosjean & Soares 1986, Grosjean 1988, Hazan & Boulakia 1993, Bürki Cohen et al. 1989, Li 1996). In essence, these studies endeavor to determine whether the base language biases a bilingual's perception of guest language tokens such that the perceptual cut-off point for the voicing distinction in the guest language is shifted toward that of the base language. The materials are designed using natural or synthesized stimuli embedded within a base or carrier phrase, as illustrated in (2).

notes check

(2) Elman et. al. (1977: 972) switching stimuli
   a. "Write the word /pa/"
   b. "Escriba la palabra /pa/"

A shift in the perceptual boundary is interpreted as evidence of a bilingual's inability to fully suppress the auditory–acoustic properties of the base language when processing in the guest language. The results of these studies have been mixed, although some report evidence of a cost in perceptual switching, as evidenced by a boundary shift toward the base language when processing stimuli with language-neutral VOT values.

There are comparatively few switching studies devoted to phonetic *production* during CS. Those that do exist conclude that bilinguals produce categorical differences between languages with respect to the VOT variable (Caramazza et al. 1973, Hazan & Boulakia 1993, Grosjean & Miller 1994). This is taken as evidence that, at the phonetic level, the switch between languages is complete. The interpretation of these findings has been extended to support the hypothesis that "in normal speech" (Green 1998) or "under natural circumstances" (Thomas & Allport 2000), bilinguals may be able to inhibit one lexicon in production. However, the fact that bilingual speakers are capable of producing non-overlapping or distinct phonetic categories for their voiceless stops across languages while engaged in CS does not necessarily imply that CS has no effect on phonetic production. Rather than anticipating a complete effacement of the categorical distinction between voiceless stops across languages, we might expect that more subtle phonetic reflexes of CS are possible, as we have outlined above in (i-iii).

note.

Switching studies, as currently designed, may be too restrictive to fully probe the consequences of CS on the sounds systems of the bilingual's component languages. First, such studies assume that the base language is static and that it is the source of inter-lingual transfer when it could well be the case that bilinguals modulate their production of the base language in anticipation of a switch. That is, the base language, as well as the guest language, could be a target for phonetic adaptation. Secondly, the insertion of a single guest word or, often, a single nonce syllable, into a base language carrier phrase may not adequately replicate natural CS. Rather, the guest element may be more akin to a lexical borrowing or, quite possibly, may be interpreted as an element that is to receive a contrastive focus due to its foreignness. Consider, for instance, the stimuli of Grosjean & Miller (1994), where a proper name, in this case "Carl," is the guest word to be pronounced in the alternate language phonetics (in French in (3a) and in English in (3b)):

(3) Grosjean & Miller (1994: 203) stimuli for production study
   a. "During the first few days, we'll tell him to copy ***Carl*** constantly."
   b. "Pendant les premiers jours, il faudra qu'il copie ***Carl*** constamment."

Here, the stimulus is a homonym with a similar pronunciation across languages. It is not difficult to imagine, then, that a bilingual participant might actually over-articulate the guest word to distinguish it from its base language homonym.

In sum, psycholinguistic switching studies have been instructive about the efficacy with which bilinguals alternate between different phonetic systems. However, we expect that, by their experimental design, such studies present a conservative picture of the effects of CS on the sound systems of the bilingual's languages. Moreover, the conclusions reached in switching studies of production seem to be at odds with the results of sociophonetic studies, where a variety of behaviors among bilinguals are revealed when the sub-phonemic level is examined.

Sociophonetic studies

The linguistic literature on bilingual pronunciation is rife with evidence that bilinguals – even those who have acquired a second language early in life and who can pass as native speakers of their L2 – often produce compromised phonetic values relative to those of monolinguals (see Flege & Eefting 1987a,b). More intriguing for the present study, however, is evidence that the VOT value of bilinguals in their *first* language has been shown to be vulnerable to the influence of a strong second language in various ways. For instance, the L1 values of bilinguals have been observed to converge toward those of their L2 (see Flege & Hillenbrand (1984) on French-English bilinguals and Major (1992) on English-Portuguese bilinguals). Conversely, Flege & Eefting (1987a,b) found that a bilingual's first language VOT values may equally well *diverge* from that of their L2, thereby enhancing the VOT contrast between languages while exaggerating the values of the native language relative to the production of monolinguals. Finally, Sancier & Fowler (1997) documented that the VOTs of the languages of a Portuguese-English bilingual move in tandem – shorter voicing lags in a Portuguese-speaking environment and longer lags in an English-speaking one. They refer to this phenomenon as *gestural drift*. This drift can take place in a relatively short period of time, as a bilingual moves between environments in which one language or the other is dominant. Such findings suggest that the low level phonetic implementation of a contrast for bilingual speakers remains remarkably flexible and subject to modification in accord with his or her linguistic experience.

The gradient shifts attested in the phonetic production of bilinguals can be taken as evidence that the phones of the two languages reside in a common phonological space (Flege 1995). Under this view, the co-influence between the languages can be understood as micro-adjustments at the phonetic level that result from the necessity to accommodate sounds that are perceived to be 'similar' within that same space. This kind of accommodation is likely motivated by principles of cross-linguistic perceptual organization that are not yet well understood.

However, sociophonetic accommodation can also be intentional. At an individual level, speakers are known to adjust their rate of speech, their pitch, loudness, etc., even their overall accentedness for communicative reasons. At the social level, speakers also use linguistic variables to convey information about themselves and their group identity and, when doing so, they often alter the form of their speech relative to that of their interlocutors, either as expressions of solidarity or dissonance. Particularly relevant in the present context is the work of Khattab (2002a, b, 2007, 2009) on phonetic accommodation among Arabic-English simultaneous bilingual children. In case studies of naturalistic conversation between these children and their mothers, Khattab reveals that the children demonstrate considerable sociophonetic variation within and across their languages to the point of producing accented forms of one of their native languages to conform to the second language variety of their parents. She suggests that bilinguals have an expanded sociophonetic repertoire that must be considered as part of their phonological competence (see Queen 2001, Fagyal 2005 on bilinguals' sociophonetic repertoires).

The present study

When considered together, the linguistic and sociophonetic literature on bilingual production indicates that the phonetic systems of bilingual speakers are malleable. Further, it would appear that bilinguals may follow different perceptual paths in representing their component languages and may use multiple strategies when putting them to use. Such observations have generally been gleaned from studies of bilinguals performing in one of their languages at a time, i.e., monolingually. One would expect that the potential for co-influence would be increased when bilinguals are performing bilingually. Because CS requires a bilingual to activate and use both languages simultaneously, evidence of the various linguistic and sociophonetic strategies followed by bilinguals should be more apparent in CS than in monolingual speech. This provides the conceptual motivation for the present investigation, a part of which has been previously published (Bullock et al. 2006). writing

Guiding questions

The overall study seeks to redress the limitations of the previous research on VOT production in language switching paradigms (reviewed in § 2 above). While switching studies established that bilinguals maintain categorically separate voiceless stop categories across languages while switching between them at a lexical level, our study aimed to determine whether evidence of cross-linguistic influence of a more subtle nature would be revealed in bilingual CS at the sentential level.

Unlike the switching studies, we did not assume that cross-linguistic influence would be uni-directional (i.e., from the base language to the guest language); rather we tested directionality as an independent variable. One primary goal of Bullock et al. (2006) was to examine the possibility that the phonetic system of the L2 might be more vulnerable to inter-lingual influence than the L1, since L1 phonetic categories are arguably established early. To anticipate the findings somewhat, we found that this was not the case; therefore, we extended the study to include participants with more balanced bilingual proficiency. We report here on the behavior of three groups of bilingual participants – Spanish L1-late English L2, English L1-late Spanish L2, and early Spanish-English bilinguals – focusing on the overall patterns of their responses and how to interpret these patterns.

Methodology

The studies included 288 test sentences one third were test sentences and two thirds were fillers. The test items comprised 24 monolingual (12 Spanish and 12 English) sentences plus 72 code-switched sentences (36 English→ Spanish and 36 Spanish→English). All stimuli included three voiceless stops, with tokens of /p, t, k/ counterbalanced across all sentences. Samples of the monolingual stimuli appear in (4).

(4) a. Monolingual English
Who <u>t</u>ook the <u>c</u>ap from my <u>p</u>en?

b. Monolingual Spanish
<u>P</u>ara <u>qu</u>ién es la <u>t</u>orta?
'For whom is the cake?'

The 72 bilingual sentences each included three voiceless stop tokens embedded in three different contexts or sites: before the code-switch, directly at the switch site, and in a post-switch position. The pre-switch and post-switch positions could occur anywhere from two to six syllables away from the switch site. Examples of the bilingual stimuli, tagged for the appropriate sites, appear in (5).

(5) a. **<u>T</u>**odos mis amigos **<u>t</u>**alked Spanish as **<u>k</u>**ids.
↑pre-switch ↑switch ↑post-switch

b. The **<u>t</u>**yphoon damaged **<u>t</u>**echos y **<u>p</u>**aredes.
↑pre-switch ↑switch ↑post-switch

Coding the data for 'switch site' allowed us to measure the effect of the direction of a switch (from Spanish to English or vice versa) and it allowed us to analyze whether or not subjects would phonetically anticipate and recover from a code-switch.

Data from 33 bilinguals participants are reported on here: 8 early Spanish-English bilinguals and 25 late bilinguals – 15 L1 Spanish and 10 L1 English. All participants completed the tasks without disfluencies or significant pauses in their monolingual and CS productions. Participants were categorized as early bilinguals if their age of onset of acquisition of English was under 5 and if they had sustained regular use of both languages since that time. For the early bilingual participants, the average age of onset of English acquisition was 3. The average age of L2 onset for the L1 Spanish bilinguals was 12 and that for the L1 English bilinguals was 14. The average age of all participants was comparable, ranging from 26 to 31. The groups differed in their assessment of their Spanish and English proficiencies, with the early bilinguals self-reporting the best balance of bilingual proficiency. Spanish and English proficiencies were respectively self-assessed on a seven-point scale, where 1 represents low proficiency, as follows: 6.31 and 6.48 for early bilinguals; 7 and 4.5 for L1 Spanish bilinguals; 5.75 and 7 for L1 English bilinguals. All participants were recruited on campus. The early bilinguals were university students and faculty of various disciplines. More notably, the late bilinguals (L1 Spanish and L1 English) were all employed as Spanish teachers.

The study was completed on the university campus over two days, separated by one week. The first day of testing, was 'monolingual': participants were asked in Spanish to read aloud the monolingual Spanish sentences and to complete a Spanish proficiency test. On the second day, bilingual and English language activities were presented with an interval between them. First, participants read the CS sentences and after a recess, they responded to language history and language attitude questionnaires presented in English by an English-speaking researcher, and, finally, they read aloud the monolingual English sentences. The stimuli were presented in randomized blocks (monolingual English, monolingual Spanish, bilingual CS), using e-Prime. Participants' reading of the sentences was recorded using a Marantz PDM 660 flash recorder and a head-mounted unidirectional microphone and digitized at 44 kHz 16bit quantization. All target tokens of /p, t, k/ were extracted and measured using Praat, developed by Boersma (2001). The figure below illustrates a waveform and spectrograph of one participant's production of the bilingual sentence (5a).

These measures were submitted to statistical analysis using a two-way repeated measures ANOVA with two (language: Spanish, English) by four (site: monolingual, pre-switch, switch, post-switch) by three (phoneme: /p/, /t/, /k/) factorial design. The significance level was set at $^{*}p<.05$ for all analyses.

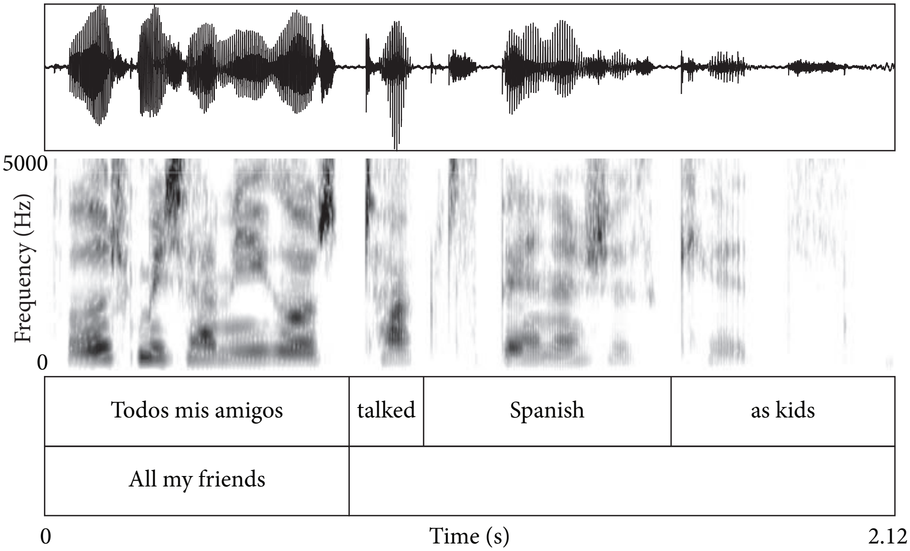

Figure 1. Spectrograph of code-switched sentence

Results

For each group, there was a significant main effect for language, site, and language by site. (There are no statistical differences for phonemes.) All groups showed a highly significant effect of language, where mean Spanish VOTs were significantly lower than mean English VOTs across the board. Within each group there was equally a significant effect of site within each language. Our focus is to compare bilinguals' mean English VOTs in their monolingual productions with their mean English VOTs in their bilingual productions, and similarly, their mean Spanish VOTs in their monolingual productions with their mean Spanish VOTs in their bilingual productions. The descriptive statistics of the mean VOTs for each site within each participant group are displayed in Table 1.

Note that with respect to the monolingual VOTs, the early bilingual group has the most dispersed mean VOT values between languages (22ms. in Spanish vs. 60ms in English). Surprisingly, their mean VOT for Spanish actually shows shorter voicing lags than their L1 Spanish–late L2 English counterparts. They also produce mean English VOT (60ms.) values that very closely approximate those of the L1 English–late L2 Spanish speakers (61ms.). We can state that, with respect to these numbers, the early bilingual group is the one that performs the closest to a monolingual-like norm in both languages, more or less reflecting their self-reported balanced proficiency.

Table 1. Mean VOT values in ms. by language, site, and group

		Early bilingual	L1 Spanish	L1 English
Spanish	**Monolingual**	**.022**	**.025**	**.031**
	Pre-switch	.023	.023	.028
	Switch site	.026	.026	.031
	Post-switch	.025	.027	.032
English	**Monolingual**	**.060**	**.055**	**.061**
	Pre-switch	.051	.043	.055
	Switch site	.057	.048	.056
	Post-switch	.063	.054	.060

The results of the statistical analysis of the significant interactions between sites within a language are displayed in Tables 2 and 3.

Table 2. English VOT monolingual vs. bilingual sites

	Pre-switch site (E→S)	Switch site (S→E)	Post-switch (S→E)
L1 Spanish	*	*	
Early bilinguals	*	*	
L1 English	*	*	

Table 3. Spanish VOT monolingual vs. bilingual sites

	Pre-switch site (S→E)	Switch site (E→S)	Post-switch (E→S)
L1 Spanish			
Early bilinguals		*	*
L1 English	*		

As shown in Table 2, for each group, the English VOT means at the pre-switch (when switching from English to Spanish) and switch sites (when switching from Spanish into English) differ significantly from the participants' English monolingual VOT means. In each case, the phonetic change is in the direction of convergence towards Spanish, regardless of the direction of the language switch. At the post-switch site, the VOT average recovers to the participants' monolingual

English values, indicating that the effect of CS on phonetic production is localized rather than global through the utterance. Unlike the English results, the Spanish results in Table 3 show considerable variation across groups. The L1 Spanish bilinguals demonstrate stable Spanish VOT mean values, with no significant differences between monolingual and bilingual conditions. The L1 English participants do show significant effects with respect to their Spanish monolingual productions in anticipation of a switch to English. However, the Spanish VOTs produced in this pre-switch position are significantly *lower* than those they produce in monolingual Spanish; that is, the shift is away from English, not toward English. Only the early bilingual group showed significant convergence of Spanish VOT mean values toward English VOT values while engaged in CS. This merger occurred after switching from English into Spanish and persisted through the utterance. This is, in essence, the base-guest effect targeted in switching studies.

Discussion

Overall, the above results reveal that bilinguals do maintain separate phonological categories for voiceless consonants across languages. Nonetheless, there is significant evidence of the effect of CS on phonetic production. The effect can be bilateral, with each language influencing the other, or unilateral, with only one language being affected. Significantly, the L1 is not impermeable to influence from the L2; the L1 English group and the early bilinguals both showed convergence in the L1 system. In addition, the results indicate that the direction of the switch does not necessarily determine the phonetic outcome, since all groups show convergence of English towards Spanish irrespective of whether English is the 'base' or the 'guest' language. In summary, bilinguals demonstrate diverse effects of CS on production in one or both languages: they demonstrate phonetic anticipation of a switch, phonetic perseveration from a switch, and these shifts can be divergent or convergent in consequence and asymmetric in direction, affecting only one language.

It is to be noted that the English language results were uniform across all groups, but the Spanish language results were dispersed. The question that arises, then, is how to account for the disparity between languages. We surmise that the results can be interpreted by reference to both linguistic-internal differences (i.e. inherent differences between Spanish and English) and linguistic-external differences (e.g., differences in proficiency, language practices, metalinguistic awareness across groups). We begin by considering the findings for English. Recall that all groups showed significant effects of CS on English VOT, both before the switch to Spanish and at the switch from Spanish, in the direction of Spanish. That is, at these sites, all groups showed evidence of phonetic convergence toward Spanish. This pattern could well arise from linguistic differences between English and

Spanish. English permits a wider span of VOT values for voiceless stops, ranging from ~ 30–120ms. However, it may be that more precision is required to maintain short lag Spanish stops, which range from ~0–30ms. If this is the case, then there is more 'room' for convergence in English than in Spanish, and English VOTs can lower toward Spanish language values while remaining recognizably English-like. Therefore, inherent differences between Spanish and English could in part explain the similar behavior observed across groups.

And although it may seem counterintuitive, proficiency differences across groups could also be implicated in explaining their similar behavior. First, the L1 Spanish bilinguals were of relatively low English language proficiency with respect to other groups. It is possible that they could not easily control their English VOT in CS, hence, they experienced 'normal' interference from Spanish to English, L1→L2. The L1 English bilinguals, who were Spanish language instructors, may have over-controlled their Spanish VOT. Thus, they produced Spanish-accented English immediately before and at the switch site. In this respect, it could be said that these speakers showed a 'hypercorrective' effect, where their L2 Spanish had a significant influence on their L1 English, L2→L1. Thus both groups of late bilinguals showed identical patterns of inter-linguistic influence from Spanish to English, although likely for different reasons. It is unclear whether the same shift in the early bilingual group can be attributed to interference or hypercorrection. As will be discussed below, the early bilinguals, unlike the late bilingual groups, also showed inter-lingual effects in their Spanish. We suggest that the bilateral nature of their performance, L1↔L2, reflects phonetic convergence.

Turning to the Spanish monolingual and bilingual language productions, we find disparate behaviors across groups. Recall that the early bilinguals showed significant effects of CS on Spanish VOT at and after switch site; the L1 English bilinguals showed significant effects of CS at the pre-switch site, but in the wrong direction; the L1 Spanish bilinguals showed no significant differences between their monolingual and CS Spanish productions. Here, the challenge is to account for the dissimilar behavior across groups. Again, we can appeal to both linguistic-internal and -external explanations. The L1 English speakers have high mean VOT values in their monolingual productions (31ms.). Exceeding these values could potentially push the consonants noticeably out of the Spanish range. Therefore, there is no merger toward English. In this instance, convergence in CS is phonologically constrained. Note that these speakers demonstrate significantly lower Spanish VOT means in anticipation of a switch to English – that is, divergence away from English. But immediately upon switching, their English VOT values are also significantly lowered toward the Spanish range. The overall effect is one of *gestural drift*, with the probable function of maintaining or enhancing the contrast between Spanish and English. In contrast, for the L1 Spanish bilinguals, the potential influence of English on Spanish is likely mitigated by their low English proficiency. For these speakers, Spanish might be said to serve as a phonetic 'matrix' language so that they produce monolingual-like Spanish and Spanish-accented English in their CS productions. Finally, the early bilingual group, with the lowest overall mean VOT in monolingual Spanish, has the phonetic latitude to converge toward English-like VOT in Spanish and the proficiency to bring about such convergence.

The sociophonetics of code-switching

When interpreted from the perspective of the psycholinguistic switching paradigm, the results of our study are clearly unanticipated. The research aim of the switching studies is to examine bilingual control as determined by the ability to fully and immediately 'turn off' the phonetics of the base language when switching into the guest language. Instead, what we have found is evidence that all bilinguals can modulate the phonetic properties of their languages in anticipation of a switch as well as show signs of phonetic carryover after a switch. Moreover, when we examine the phonetic performance of both languages of a bilingual, a variety of phonetic outcomes of CS are revealed. From our perspective, cognitive control is but one factor in guiding the phonetic performance of bilinguals and its role may be limited.

We infer from the fact that all the bilinguals in this study proved capable of maintaining separate categories for their voiceless stops that they can exercise control of their languages while code-switching. More intriguing is that they appear to be able to take different paths in resolving cross-linguistic phonetic differences within these categories while engaged in CS. These result in different outcomes, which can be identified as follows:

i. Divergence (maintain or enhance contrast) L1←→L2
ii. Convergence (compromise) L1→←L2
iii. Interference: L1→L2
iv. Hypercorrection: L2→L1

We speculate that the path that bilinguals may take depends partially on how alike or how different they perceive phonetic differences to be. In all studies of bilingual phonetic production, it is taken for granted that the voiceless stops constitute perceptually congruent phoneme categories across Spanish and English. However, the notions of perceptual and structural congruence remain ill-defined and it is not known if perceptual similarity across the languages of a bilingual is driven by universal perceptual principles (Johnson 2004) or if congruence is a relative notion that may vary between individuals and groups (Sebba 2009).

Sebba (2009) argues on the basis of observations of the morpho-syntax of CS that inter-lingual congruence may, in part, be constructed by individual speakers. Accordingly, individuals who differ in terms of language proficiency, practice, education and metalinguistic awareness may employ different strategies in order to treat inter-lingual categories as somehow equivalent in CS. For example, he notes that Moroccan French-Arabic bilinguals must reconcile gender differences that arise in CS between the two languages. The resolution strategies that these speakers adopt are not uniform. For instance, example (6) appears to show a lack of gender agreement between the feminine Arabic adjective for "whole" (feminine) and the masculine French noun for "journey" (masculine). However, it is to be noted that the corresponding noun in Arabic is feminine, thus the speakers who produce such forms are employing 'hybrid' agreement, where the adjective agrees with the translation equivalent of the overtly expressed noun. Other French-Arabic bilinguals show different agreement or 'harmonization' strategies.

(6) dak le trajet kulha
that$_{Ar}$ the$_{Fr}$-M journey$_{Fr}$-M whole$_{Ar}$-F
'the whole journey' (Bentahila and Davies 1983: 327)

Following Sebba, the harmonization patterns of Moroccan Arabic-French bilinguals may be either partly constructed by individual speakers who differ in their metalinguistic knowledge (e.g., the above 'mixed' agreement pattern is observed among educated speakers), or they may be acquired as a conventionalized community norm. Thus, CS patterns may manifest considerable variability across speakers and across bilingual communities, even when the same language pairing is involved.

Applying Sebba's notions to the CS findings here, the patterns of divergence (in L2 Spanish) and hypercorrection (in L1 English) that were witnessed among the L1 English bilinguals – all of whom were university Spanish instructors – may evidence a strategy employed by educated speakers, metalinguistically aware, and highly proficient L2 speakers. In contrast, the unidirectional interference of Spanish on English among the L1 Spanish bilinguals may arise from their low level of English language proficiency coupled with their extensive use of the L1 (recall that they too were Spanish instructors). The early bilinguals demonstrated a symmetrical convergence pattern, with each language merging toward the other. Various explanations have been presented, based on linguistic and proficiency differences, i.e., their contributing languages have the phonetic latitude to allow for convergence, and the speakers possess a high degree of proficiency in both languages. But it may be likely that these bilinguals have been socialized into language alternation and CS in their home communities and with their school peers. That is, their language use patterns may lead to more phonetic convergence. In this respect, the early bilinguals possibly show conventionalized patterns in their CS forms, where compromise between the two languages may be the norm when both languages are engaged.

Conclusion

This work has demonstrated that CS does have significant phonetic reflexes in bilingual production, but the direction of influence between the bilingual's two languages is not predetermined or uniform. The inter-lingual influence can be asymmetric, affecting only one language, or it can be bi-directional, affecting both. And the direction of influence can be toward or away from the language that is not immediately selected in the CS utterance. Returning to the metaphor of our title, we have seen that all the bilinguals under examination here are accurate in hitting the appropriate, respective phonetic ranges for their component languages. At the same time, their targets within those ranges may move slightly in their attempt to maintain cross-linguistic contrast while also 'harmonizing' their two systems with respect to segments that are, perhaps in varying senses, perceived to be congruent. We have suggested that bilinguals' strategies of harmonization are diverse and motivated by language-internal and -external factors that cannot be easily reduced to the common variables in bilingual studies, such as L1 dominance or age of acquisition.

These findings and conclusions invite further research, and a number of testable hypotheses readily present themselves. First, we have suggested that the implementation of the English voicing contrast permits a great deal of latitude in the expression of voiceless stops. It would prove instructive, therefore, to study a pairing of languages that differ with respect to the implementation of the voicing contrast, for instance, Chinese and English. Other phonological variables also merit attention. While we have focused attention on gradient, low level phonetic properties, it is worthwhile to examine categorical phonological differences, which ought to be more salient – for instance, the presence of vowel reduction in English versus its absence in Spanish.

Second, we have suggested that enhancing contrast – referred to above as hypercorrection – might be a strategy employed by educated and metalinguistically aware bilinguals. This predicts that groups matched for proficiency, language usage patterns, etc., but who differ in terms of education and metalinguistic awareness should show different patterns. In addition, we have argued that convergence may be conventionalized, acquired as part of the bilingual's sociophonetic repertoire (in the sense of Khattab). However, the notion of 'conventionalized norm' should be scrutinized, as bilingual communities may differ with respect to how they harmonize the two systems in CS. Therefore, further research on naturalistic CS within diverse bilingual communities is essential.

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CHAPTER 9

Which language?

Participation potentials across lexical categories in codeswitching

Janice L. Jake and Carol Myers-Scotton
MidlandsTechnical College (Columbia, SC), Michigan State University

How the Matrix Language Frame model and the 4-M model of morpheme classification, along with Asymmetry Principle and the Uniform Structure Principle, distinguish morpheme types leads to predictions that different types of Embedded Language prepositions and complementizers/subordinators have different potentials to occur in Matrix Language frames in codeswitching. Testing these predictions against the codeswitching literature supports not only the predictions, but also the frameworks and principles that motivate them, especially the Differential Access Hypothesis. Content morphemes, whether they are Embedded Language prepositions or subordinators, are most robust, followed by early system morphemes, especially satellite prepositions in phrasal verbs. Embedded Language bridge system morphemes are rare, but there are some exceptions (Moroccan Arabic *dyal* and '*that*-type' complementizers in specific language pairs). With few or no exceptions, no Embedded Language outsider system morphemes occur in mixed constituents in classic codeswitching, nor are they found in composite codeswitching, where other types of Embedded Language morphemes may be more frequent and there is convergence.

Introduction

Predicting which language supplies which elements in bilingual clauses.

Codeswitching (CS) refers to language use that consists of material from two or more language varieties at any level from the discourse to the clause. However, it is only when switching is within a clause containing elements from more than one variety – that is, a bilingual clause – that the languages are truly in contact. When this happens, an obvious question is, which elements may or must come from which of the participating languages? Empirical evidence from naturally-occurring CS corpora makes clear that the language supplying the grammatical frame of the clause, the Matrix Language (ML) in the model followed here, may supply all types of morphemes. The same evidence indicates that the potentials of the other participating language(s) in that model, the Embedded Language (EL), are more limited. These findings give rise to the following hypothesis: whether certain elements in CS data may come from the EL can be predicted based on the morpheme type of those elements. In this paper, we consider elements from two lexical categories to test this hypothesis, and to exemplify our argument that different morpheme types have different distributions, especially in the EL: prepositions and complementizers/subordinators.

Predictions about morpheme type and potential occurrence in the EL are motivated by the central claims of the two models that we employ, especially the argument that the nature of morpheme types and the level at which they may be accessed in language production affects their distribution in surface level constructions. Here, we introduce the models, but discuss them in more detail in later sections. First, the Matrix Language Frame (MLF) model asserts that the two (or more) participating languages do not contribute equally to CS clauses in a number of ways. The model is based on the premise that CS takes place 'within the constraints of a conceptual frame' and that 'the frame is largely set by the semantic and morphosyntactic procedures...of only one of the two (or more) languages participating in CS' (Myers-Scotton, 1993, 1997: 75). Two principles of the model, the System Morpheme Principle and the Morpheme Order Principle, identify this frame-building language, which is called the ML; the other participating language(s) is/are called the EL. Together, these principles, in effect, test the hypothesis that the only one participating language supplies morpheme order in mixed constituents and also supplies the type of morpheme that, under the 4-M model, is now called the outsider late system morpheme. In so doing, these principles identify the ML. Second, the 4-M model is a model of morpheme classification that distinguishes all morphemes under four types on the basis of their roles in phrase or clause structure and implies a hypothesis that differentiates them at a more abstract level (Myers-Scotton & Jake, 2000, 2009; Myers-Scotton, 2002). Under the 4-M model, morpheme types sub-divide in language production so that two types are conceptually-activated and two are structurally-assigned. Morpheme types and the production model are discussed more fully below.

In our approach, predictions about the potential for EL elements to occur in mixed constituents in CS apply primarily to morpheme type, not lexical category membership. One reason is that most lexical categories contain more than one morpheme type, as they are viewed under the 4-M model. Thus, when we discuss prepositions and morphemes that occur at clause boundaries, such as complementizers and subordinators, predictions for their possible occurrence in the EL will vary by morpheme type. Thus, the goal of this chapter is to describe and explain the relative robustness of EL morphemes in CS clauses, when the context calls for either of these two lexical categories, based on the nature of their morpheme type.

We begin by reviewing two overarching principles that preface any discussion of bilingual data. A sketch of the language production model that we follow is next. We then describe the MLF and 4-M models in a little more detail. Next, we analyze examples in which the two lexical categories identified above are filled by EL elements in the literature. Finally, we consider how well the predictions based on our theoretical frameworks match the empirical evidence, and how a model that recognizes asymmetry as well as uniform structure is superior in explaining what does and does not occur in bilingual language production.

Asymmetry as a principle in all bilingual data

What we will call the Asymmetry Principle underlies our argument here. The principle states that there is always asymmetry between the participating languages in any bilingual data regarding the ways in which they participate in that clause. Asymmetry, as it is used here, refers to structural inequality regarding bilingual data, whether at the abstract level or in production and processing.

The Asymmetry Principle is reflected in a minimum of two ways in CS that are empirically obvious: (a) the abstract morphosyntactic fame of the bilingual clause largely or entirely reflects that of one of the languages; and (b) word order tends to follow that of one of the languages. Asymmetries at such surface levels need not be stable; for example, in CS, the language that is the ML in some contexts can become the EL in other contexts. That is, which language is the ML may change across clauses in the same corpus or across different corpora – even though the participating languages remain the same. So asymmetry has a dynamic quality; its details depend on changes in relevant factors, but there is always some structural inequality. The principle also refers to more abstract asymmetries between grammatical elements that affect the roles they may fill; this is less obvious. As this chapter unfolds, it should be clear that the MLF model is based on this principle, but we will see how asymmetry is present in ways beyond the basics of this model.

Of course there are other asymmetries in bilingual language that contain the basic feature of some types of inequality, such as the gap between degrees of the participants' language proficiency in many interactions. Also, psycholinguistic experiments on bilingual word recognition tasks imply differing levels of activation in the bilingual's two languages during such tasks (e.g. Dijkstra, 2005; Meuter, 2005).

We would like to acknowledge the view that sociolinguistic factors account of certain patterns in CS (cf., e.g., Edwards & Gardner-Chloros, 2007). We agree that these factors do account for variation in certain patterns, but in this paper, our goal is to explain what does and does not occur in bilingual speech, a goal that necessarily requires focusing on how languages are structured and produced. But, our research along these lines has shown that while there is variation in language performance, this performance is limited by principles in the sense that the forms grammatical patterns in such variation can take are predictable.

Uniform structure as a principle

The consistency with which asymmetry exists in the roles of the participating languages in diverse corpora is the hallmark of what we have called classic CS. As we have already noted, only one of the participating languages, the ML, consistently is the source of the abstract grammatical frame underlying bilingual clauses. In turn, this finding leads to another principle that characterizes language in general but is especially obvious in bilingual data: Maintaining a uniform structure is preferred. In assessing monolingual data, this observation is hardly ever made, because a given constituent type in monolingual data, in effect, is defined by its uniformity whenever it appears. But in bilingual data, such as CS, there is no a priori reason to prevent structural directions for a given constituent type coming from all of the participating languages in turn, or in some other pattern. But this does not happen. This finding is formalized as the Uniform Structure Principle: 'A given constituent type in any language has a uniform abstract structure and the requirements of well-formedness for this constituent type must be observed whenever the constituent appears. In bilingual speech, the structures of the Matrix Language are always preferred....' (Myers-Scotton, 2002: 8). Thus, in CS, the ML uniformly provides basic clause structure. When grammatical structure is provided by the EL, it is almost always in the form of EL islands, which are frequently adjuncts and, therefore, not part of the grid of core thematic roles that structure the clause. The practicality of the Uniform Structure Principle is clear; that is, the asymmetry of preferencing the structure of the ML in CS enhances predictability, and predictability is the basis of interpretability. This principle is also obviously the basis for the predictability that characterizes monolingual structural patterns.

A language production model

The divisions between morpheme types tie in with the language production model that we envision in regard to covering the semantic/pragmatic and morphosyntactic features of elements. In brief, the model includes four basic levels: the conceptual level, the mental lexicon, the formulator, and the functional level (surface level). Psycholinguists remain divided on whether all levels can be simultaneously activated or activation occurs in a cascade fashion.

The conceptual level

This level contains pre-linguistic notions about what the speaker wishes to communicate. One psycholinguistic issue of concern to this paper is whether all necessary information for accessing a lexical element is present at this level. Psycholinguists differ on their hypotheses about the precise specifications of the contents and properties of the conceptual input (compare LaHeij, 2005, and Costa, 2005). We have argued that semantic-pragmatic bundles of features are accessed at this level, implying that they are only realized as language-specific lemmas that contain grammatical encoding in the mental lexicon (Myers-Scotton & Jake, 1995). Our model is based on Levelt (1989), but Levelt himself and his associates have modified their views. Citing Levelt, Roelofs & Meyer (1999), Schriefers (2005: 287) states, '.... [We] are now talking about much more complex and intelligent 'within-module' processes than we did 10 years ago.'

Selecting the matrix language

ML selection is also at the conceptual level, and depends on relevant sociolinguistic and psycholinguistic factors; that is, at this pre-linguistic level, the specific features of the individual grammars of the participating languages are not relevant. However, factors such as language proficiency can be a factor in selecting the ML. For example, speakers have to be proficient enough in what becomes the ML to employ it to build the grammatical frame of the bilingual clause. Thus, even though the Haitian speakers in Hebblethwaite (2007) live in Miami, it is no surprise that they generally make their L1 (Haitian Creole) their ML in Haitian Creole-English CS because their proficiency in (the) Creole is higher than it is in English. This does not mean the Matrix Language is necessarily the L1 of CS speakers, but it often is. Of course, speakers must have some proficiency in the language that becomes the EL for CS to take place at all. As a minimum, they must know a stock of lexical items in this language; single content words frequently make up the majority of EL embeddings in bilingual clauses. So, such factors as proficiency and group identity may well be critical in ML's selection. However, once speakers begin to codeswitch, the ML governs grammatical structuring in ways that are largely autonomous from the speaker's intentions that motivate (the act of) CS in the first place. It is in this sense that the ML becomes a grammatical construct. However, sociolinguistic and psycholinguistic factors remain relevant, especially regarding what speakers choose *to say and at what point* in a conversation involving CS.

The mental lexicon

Language-specific lemmas that underlie surface-level elements make up much of the mental lexicon. They include all the information necessary for surface level forms, except phonological information; thus, they include the three levels of abstract grammatical structure that are outlined in the Abstract Level Model (cf. Myers-Scotton, 2002: 96–97). Its levels refer to lexical-conceptual structure, predicate-argument structure, and morphological realization patterns. The notion that lemmas in the mental lexicon link conceptual information and grammatical function is at least implied in Levelt (1989). The mental lexicon also includes Generalized Lexical Knowledge at these same levels that is specific to the languages involved, although not part of the specific features of individual lemma entries; see Myers-Scotton (2002).

The semantic-pragmatic feature bundles at the conceptual level point to the lemmas in the mental lexicon. These lemmas that are directly activated underlie the content morphemes that realize these features. These content morphemes become parts of larger phrasal constructions as the thematic and pragmatic features that activated them are matched and satisfied; the lexical-conceptual structure of constituents is checked, although other grammatical features of the lexical entries realizing these larger phrasal constituents may not be salient at this level. Under the 4-M model, we refer to such directly-elected elements as content morphemes. While nouns and verbs are prototypical content morphemes, as will become evident from the discussion below, members of other lexical categories are also content morphemes.

Under the 4-M model of morpheme classification, those supporting elements that further realize the semantic and pragmatic features activated by the speaker's intentions, such as determiners and plural affixes, are called early system morphemes. Why we use the term 'early' becomes clearer when we discuss the 4-M model below. What is relevant here is that both content morphemes and early system morphemes are salient at the level of the mental lexicon and they are conceptually-activated; that is, they contain content that conveys speakers' intentions. In differentiating the level of saliency for conceptually-active morphemes (at the mental lexicon) and structurally-assigned morphemes (at the formulator), we may well differ from many psycholinguists. See the discussion of the Differential Access Hypothesis below, and the empirical data discussed there that support this view. Note that in our discussion, we use the term morpheme for both the elements underlying surface level morphemes and the abstract lexical elements that underlie them.

The formulator

The formulator consists of language-specific frame-building procedures. The conceptually-activated lexical entries that satisfy the speaker's intentions, together with other language-specific requirements for constructing constituents, send directions to the next level, the formulator, that will assemble larger constituents. Here, bridge and outsider system morphemes are activated, even though the lemmas underlying them are present in the mental lexicon. They are called 'late' because the hypothesis is that they become salient later than either content or early system morphemes. We elaborate on this hypothesis below. Both types of late system morphemes contribute structure to syntactic configurations.

The surface level

The output of the production model sketched above, along with another model that conveys phonological information, at times in concert with morphosyntactic information in the lemmas, results in a surface structure. If we are referring specifically to CS, this structure contains the morphological patterns, including word order, that are well-formed according to the ML, along with those that apply from the EL for EL islands. The formulator, of course, has produced the patterns.

The MLF and 4-M models

The two models discussed in this section complement the premises of the production model just outlined in regard to the notions that morpheme types differ in abstract ways in their roles and how they are accessed.

The MLF model

The MLF model relates indirectly to how morpheme types seem to be accessed in production. As noted earlier, the MLF model is based on the asymmetry between the frame-building potentials of the participating languages in CS; this asymmetry is obvious in naturally-occurring data. Changes in the ML across a corpus are not frequent, but do occur. However, even though the ML can change from one participating language to another, evidence shows it does not change within a single clause. In the model, this finding in early studies led to the hypothesis captured in the System Morpheme Principle of the model, the prediction that only one language (the ML) can supply the type of morpheme that performs critical frame-building functions. The 4-M model identifies this morpheme type as the outsider late system morpheme. In most languages, this morpheme type coindexes elements across phrases via agreement markers, making syntactic relations in the clause clearer. In many languages, outsider system morphemes also make the argument structure of the clause more transparent (e.g., case markers); while they may highlight thematic roles, they also spell out specifically argument and constituent structure. Examples (3) through (6) below illustrate late system morphemes.

The prediction that outsider system morphemes are limited to those from the ML is related to another asymmetry in the MLF model: The ML and EL are said to have different levels of activation, even though both languages are on during production. The ML's role in supplying these morphemes may be related to a hypothesized higher activation level for the ML. One explanation proposed for findings in experimental switching tasks in the psycholinguistic laboratory is that 'a higher level of activation may be associated with one language as compared to the other in the bilinguals lexicon' (Meuter 2005: 363). Also, experimental psycholinguistic findings support the notion that both of the bilingual's languages can be active at the same time, although not equally so (Kroll, 2008; Kroll, Bobb & Wodniecka, 2006). Such data support the asymmetry that we argue characterizes CS.

The 4-M model

The 4-M model is especially useful in fine-tuning the MLF model's distinction between morpheme types, but it is a model of morpheme classification, not CS. Elsewhere we have suggested how the distinctions of the 4-M model apply to a variety of monolingual and bilingual data such as aphasia, first and second language acquisition, and attrition (Myers-Scotton & Jake, 2000). We predict that wherever psycholinguistic processes distinguish among different types of morpheme activation, these distinctions among morpheme type will be relevant. The four morpheme types under the 4-M model are not intended to match particular lexical categories; as already noted, a given lexical category may contain several or more morpheme types.

The model's classification is based on how morphemes differ from each other in whether they are meaningful and therefore are primarily called by speakers' intentions, or whether they primarily build grammatical structure. Thus, the basic division in the 4-M model is at an abstract level, between conceptually-activated vs. structurally-assigned morphemes. The term 'system morpheme' was first used in the MLF model to differentiate them from content morphemes, which assign or receive thematic roles. It was introduced because it offers a more inclusive, and accurate, way to distinguish elements than either the terms 'open and closed class elements' or 'functional elements.' For example, not all closed class elements are of the same grammatical type; further, even among affixes, not all pattern in the same way. Also, not all functional elements have the same features. Many so-called functional elements are system morphemes, but some pronouns in some languages, such as English, for example, are content morphemes; that is, they receive thematic roles.

Content morphemes and early system morphemes

These the two morpheme types are distinguished from other types because their major function is to convey semantic content. Recall that they both become salient at the level of the mental lexicon in the production model outlined in Section 4. Based on psycholinguistic research, Bock & Levelt (1994) view the lemmas that underlie the main contentful elements in the mental lexicon as 'directly activated' by intentions at the conceptual level in their production model. They refer to lemmas that support early system morphemes as 'indirectly elected.'

Early system morphemes add meaning to content morphemes by adding various forms of specificity. They differ in that content morphemes assign or receive thematic roles and early system morphemes generally do not. Examples of content morphemes are nouns, verbs, adjectives, as well as some prepositions and some Comp-like elements. Examples of early system morphemes are plural affixes, many determiners, derivational affixes, and verbal prepositions. Verbal prepositions modify thematic roles assigned by the verb that they accompany; they modify a thematic role assigned by a verb (e.g., *take over* vs. *take*). Early system morphemes depend on content morphemes for their form and cannot appear on their own. In (1) an EL verb (English is the EL) and its indirectly-elected preposition occur in a Xhosa frame.

(1) Xhosa-English (Myers-Scotton, 2005b)
Ama-Xhosa si-zo-**take**-a **over**
CL.6-Xhosa CL.6.1PL-FUT-take-FV over
'Xhosas, we are going to take over'

Late system morphemes

late system morphemes are the structural building blocks of clauses. The Differential Access Hypothesis given below suggests that these morphemes do not become salient in our language production model until the level of the formulator. This hypothesis is the basis for calling system morphemes 'early' or 'late.' Recall that the formulator is where constituents larger than simple phrases are assembled. There are two types of late system morphemes, bridges and outsiders.

Bridge late system morphemes are defined by their role in joining together elements to produce a larger constituent that is well-formed in the relevant language. They are projected when a grammatical configuration requires them to incorporate a constituent into the larger superordinate configuration. Bridge system morphemes join phrases, and sometimes also clauses, as in the case of '*that*-type' complementizers. The most frequently occurring constructions with bridge system morphemes are genitive or partitive constructions; a larger constituent is constructed out of two smaller constituents and includes a bridge system morpheme: e.g., *of* in *the requirements of the college*. In example (2), Acholi is the ML and the Acholi associative preposition *me* builds a larger constituent out of two EL (English) nouns.

(2) Acholi-English (Myers-Scotton & Bernsten, 1995; Myers-Scotton, 2005c)
Ci gi-mi **type** me **tablets** moni …
then 3PL-give type ASSOC tablets certain …
'then [they] give [you] [a] certain type of tablets …'

As already noted above, outsider system morphemes are defined by their critical roles in frame-building, generally at the clausal level. That is, they are defined by their role of co-indexing relationships and in making argument structure more transparent. For example, subject-verb agreement coindexes the relation between subject NPs and inflected verbs; cf., English *-s* in *the young girl play-s the piano well*. In example (3) note the underlined agreement prefix (*zi-*) from noun class 10 on the Xhosa existential predicates (*zi-kho-na*). This prefix is coindexed with the class 10 prefix on *i-negative things* and *i-positive things*.

(3) Xhosa-English (Myers-Scotton, 2005b)
… zi-kho-na i-**positive things**, zi-kho-na
… CL10-EXIST-with CL10-positive things, CL10-EXIST-with
i-**negative things**
CL10-negative things
'… there exist positive things, there exist negative things'

Outsider system morphemes are called 'outsiders' because their form depends on information outside of the phrase in which the outsider morphemes occur. For example, subject-verb agreement coindexes verb phrases with nominals in other parts of the clause. Similarly, case marking on nominals depends on elements in other parts of the clause in which they occur. For example, in German, verbs and prepositions call the case markers that appear in noun phrases on determiners and adjectives, and some nouns.

Examples (4) through (6) provide further examples of outsider late system morphemes coming from the language that is identified as the ML. In example (4), Turkish is identified as the ML because it is the language that satisfies the System Morpheme Principle. It does this by supplying outsider system morphemes such as the accusative case marking that occurs on the Norwegian noun (*skap*). In example (5), the English verb *discuss* is coindexed with its subject *tennis association* with a class 9 subject prefix. (In SiSwati, as in many Bantu languages, noun classes 9 and 10 include a zero allomorph, so these nouns may have a null marking; foreign nouns, either in CS or as established borrowings, generally go in either of these classes.) In example (6), from a study of children being raised in Britain whose L1 is Mirpuri, Pert and Letts (2006: 365) note 'the child uses three English words, and three Mirpuri words for this utterance. However, the Mirpuri frame conforms to Mirpuri syntactic and grammatical constraints.' Both the direct object *baby* and the locative *bath* occur before the verb, and each English noun occurs with the appropriate Mirpuri postposition, accusative *ki* and locative *vitch*, respectively.

(4) Turkish-Norwegian (Türker, 2000: 68)
skap-ı doldur-du-k
cupboard-ACC fill-PAST-1PL
'We filled the cupboard.'

(5) SiSwati-English (Kamwangamalu, 1994: 75)
tennis association i-**discuss**-ile le-**problem**
tennis association CL9-discuss-PERF DEM/CL9-problem
ku **meeting** yabo ye kugcina
LOC meeting CL9/POSS-3PL CL9/ASSOC last
'the tennis association discussed that problem at their last meeting.'

(6) Mirpuri-English (Pert & Letts, 2006: 365)
boy baby ki **bath** vitch baja
boy baby to(ACC) bath LOC put.MASC
'[the] boy put [the] baby in [the] bath'

Implications of outsiders in CS

The preceding sub-sections show how the four morpheme types differ in their defining features and presence in syntactic structures and specifically in CS. However, their distributions in CS data may imply differences at some abstract level. Specifically noticeable, of course, is that outsider system morphemes come only from the ML in CS. This finding leads to the Differential Access Hypothesis; a production model offers an explanation for this difference in distribution with outsiders based on how the morpheme types are accessed. This hypothesis also explains distributions of other morpheme types that occur in CS (cf. Myers-Scotton, 2002: 91–93 on morpheme doubling and the Early System Morpheme Hypothesis).

> The Differential Access Hypothesis: The different types of morpheme under the 4-M model are differentially accessed in the abstract levels of the production process. Specifically, content morphemes and early system morphemes are accessed at the level of the mental lexicon, but late system morphemes do not become salient until the level of the formulator. (Myers-Scotton, 2002: 78, cited in Myers-Scotton, 2005a: 339)

Findings from corpora outside of CS also imply that late system morphemes, and especially outsiders, pattern differently in their accessibility than content and early system morphemes. For example, Wei (1996, 2000) found that Chinese and Japanese learners of English as a Second Language initially had more difficulty producing accurately third person singular *-s* for third person (as an outsider), present tense followed by *-s* (as a bridge) standing for possessive (e.g. *Stella's bed*) or marking noun plurals (an early system morpheme). Further, reanalysis of data from patients with Broca's aphasia shows that outsider system morphemes, followed by bridges, were responsible for more inaccuracies (speech errors) than early system morphemes (Myers-Scotton & Jake, 2000). Also, although the data are limited, speech error examples imply differences in distribution for morpheme types that also support the distinctions that the Differential Access Hypothesis predicts (Myers-Scotton, 2002: 72–74). In addition, Dussias & Gerfen (2008) have designed psycholinguistic experiments that will test this hypothesis, at least indirectly. They consider costs in terms of response time in comprehending sentences showing Spanish-English CS, depending on the morpheme types that are switched.

Predicting morpheme distribution in CS

We begin this section with a hypothesis, the Morpheme Sorting Hypothesis, that we will find generally holds for classic CS data.

> The Morpheme Sorting Hypothesis: The Uniform Structure Principle, the Asymmetry Principle, and the 4-M model together predict the source of different morpheme types in CS – whether from the ML or the EL. When the option for EL morphemes is open, different morpheme types have different potentials within bilingual constituents.

In the sections below, we test the Morpheme Sorting Hypothesis for two categories – prepositions and lexical items that mark clause boundaries, complementizers and subordinators, which we refer to here as Comp-like elements. Within these categories, different morpheme types lead to different predictions. Recall that the four morpheme types of the 4-M model are not to be confused with lexical categories, and there is no fixed correspondence of lexical category to morpheme type. Typically, a lexical category may be realized through several morpheme types, as we will show. The definitions of the morpheme types are universal, but cross-linguistically the same lexical categories need not have the same grammatical properties. For this reason, the same lexical category or sub-category need not correspond to the same morpheme type in different languages.

Prepositions

We first turn to how the Morpheme Sorting Hypothesis applies to prepositions in classic CS. The default prediction is that, in bilingual constituents, obviously, any ML prepositions can occur, regardless of their morpheme type. Therefore, our concern here is predicting the occurrence of EL prepositions and their postpositional counterparts. Based on the 4-M model, the hierarchy below is predicted to hold for EL prepositions occurring in an ML frame:

Content Morphemes	**Early SMs**	**Bridge SMs**	**Outsider SMs**
From the ML or EL	More from the ML than EL	Rarely from the EL	None: Only in monolingual EL constituents

Figure 1. Distribution of morpheme type in bilingual constituents

Prepositions as content morphemes.

Some prepositions add arguments to the thematic grid of the clause they occur in, such as optional beneficiaries or source, such as *for someone* or *from someone*. Some prepositions add adjunct phrases, such as instrumental or directional and locative phrases, as in *with a knife* or *beside the road*. These prepositions spell out the thematic roles that their NP play in the larger clausal structure; they allow the nominal complements to be mapped onto the semantic and predicate-argument structure of the clause so there is a logical interpretation of the relationship of the nominals to the remainder of the clause.

Singly-occurring EL prepositions that are content morphemes occur in mixed PP constituents, although they are not as frequent as ML prepositions. Examples (7) through (10) illustrate instances of such prepositions. Example (7) illustrates an English preposition *from* in a Haitian Creole frame; it assigns a directional thematic role (ablative) to its complement. Hebblethwaite (2007) reports nine different English (EL) prepositions (25 tokens) occurring in this pattern. Similarly, in (8), an English preposition *before* occurs with a Swahili complement. In example (9), the same English preposition functions as a subordinator, introducing a Xhosa complement, and clarifying the semantic relationship of the main clause event to the reference frame of the subordinate clause. Example (9) also illustrates the notion that it is how a morpheme is activated that determines its occurrence in CS. Whether *before* functions as a preposition introducing an NP or as a subordinator introducing an adverbial clause is not what is crucial; what is crucial is that it is conceptually-activated, a thematic role assigner. As a locative preposition, it assigns the thematic role that maps a state or an event onto the thematic grid of a clause, either spatially or temporally. In the case of (9), the subordinate clause functions as a temporal locative in the thematic grid of the matrix clause.

(7) Haitian Creole-English (Hebblethwaite, 2007: 296)
... yo **djus** vini **<u>from</u>** Ayiti...
'... they just came from Haiti...'

(8) Swahili-English (Myers-Scotton, 1993; 1997: 124)

Labda, [...]	**bring it at my home.**	U-let-e
Perhaps well,	bring it to my home.	2S-bring-SUBJUNCT

<u>before</u> kesho jioni.
before tomorrow evening
'Perhaps [...] bring it at my home. You should bring it before tomorrow evening.'

(9) Xhosa-English (Myers-Scotton, 2005b)

Ok, e	nje-ngo-ba	u-hleli	u-lapha	u-ya-yazi
OK, yes	mostly-about-BE	2S-stay	2S-here	2S-PRES-know

moss	u-ba	kwa-kunjani	**<u>before</u>**	ku-fik-e	inkululeko?
exactly	INF-BE	OF-how	before	LOC-arrive-SUBJUNCT	freedom

'Okay, yes, as you are permanently here, do you know exactly how it was before freedom (arrived here)?'

Example (10), from Ewe-English CS, shows an English preposition that is a content morpheme heading a PP otherwise in Ewe (the ML). Amuzu (2005) notes that such English prepositions occur in mixed copula constructions. He specifically mentions these English prepositions: *behind, beyond, between, inside, above*. He says that they are all relational locative prepositions and differ in this way from *on* and *in* which case-mark a specific point locative object.

(10) Ewe-English (Amuzu, 2005: 81)
Mia ƒe agble-a le **beyond** tOsisi ga ma
1PL POSS farm-DEF BE/PRES beyond river big DEM
'Our farm is beyond that big river.' [Note: O = lax, open o].

EL islands and prepositions

In addition to assigning, thematic role, prepositions also assign case to their complements. For example, *after* assigns objective case to its complement, as in *after me*. One way to keep the link between a preposition that is a case assigner and its case receiver explicit is to have the entire PP constituent in one language. Thus, not surprisingly, EL prepositions that occur heading EL islands are more frequent in most data sets than lone EL prepositions. For example, Hebblethwaite (2007) reports 16 different English prepositions occurring in islands (36 tokens) in his Haitian Creole-English corpus. See example (11). In (12), an English PP EL island occurs in Xhosa-English CS (Myers-Scotton, 2005b). There are also many examples in Nortier's (1990) Moroccan Arabic-Dutch data. In (13) the EL island is from Dutch and in (14) it is from Arabic.

(11) Haitian Creole – English (Hebblethwaite, 2007: 298)
L ap saspiye kòb **for nothing**
'She is wasting money for nothing'

(12) Xhosa-English (Myers-Scotton, 2005b)
Uba ndi-nga yi-fuman-a **at this stage** loo nto
if 1S-can-CL9/OBJ-get-FV at this stage DEM thing
'If I can get it at this stage, this thing'

(13) Moroccan Arabic-Dutch (Nortier, 1990: 135)
... u texrŭz m9a-hŭm **naar de stad**
... and go.out.IMPERF.2S.M with-them to the city
'... and you go out to the city with them'

(14) Moroccan Arabic-Dutch (Nortier, 1990: 160)
ze verdedigen je **f-dik s-sa9a**
they defend you at-that the-time
'they defend you at the same time'

Prepositions as early system morphemes

Early system morpheme prepositions can occur from the EL in bilingual constituents, even though, as expected, they seem to be less frequent than content morphemes. As noted above, in many data sets with English as the EL, the most frequent EL early system morphemes are prepositions in phrasal verb constructions such as *take off*. Such prepositions are early system morphemes because they are indirectly elected by the verb. They modify the thematic structure projected by the verb. For example, *throw away* still takes one argument, but the indirectly-elected preposition modifies the meaning of the verb *throw*. Compare *throw the ball* and *throw away the old chair / throw the old chair away*. These early system morphemes can come from either the ML or the EL. Pfaff reports examples of singly-occurring English prepositions that are early system morphemes in her Spanish-English corpus, as in (15).

(15) Spanish-English (Pfaff, 1979: 302)
el dentista agarrabe <u>**off**</u> y se iba **fishing**
'the dentist took off and went fishing'

Sometimes, both the verb and its satellite preposition come from the EL, as in (16) and (17). In (16), the inflected Shona verb is a 'do' verb; this is the compromise pattern by which English verbs are sometimes integrated into this Bantu language. In the Ewe-English example in (17), the English verb is inflected with Ewe tense and agreement. In this example, the verb and its preposition are activated as a unit at the conceptual level to realize a bundle of semantic and pragmatic features, not just the notion of *keep[ing]*, but the notion of 'exclusion' that the indirectly elected *away from* adds. However, the lexical items are integrated into the Ewe frame as an inflected verb and the head of a prepositional phrase.

(16) Shona-English (Myers-Scotton, 2001: 51)
Va-no-nok-a ku-it-a <u>**catch up**</u> mu-ma-**lessons**
3PL-PRES-be.late.FV INF-do-FV catch up LOC-CL6-lessons
'... they are late to catch up in [their] lessons.'

(17) Ewe-English (Amuzu, 2005: 140; cited in Myers-Scotton, 2002: 89)
De me-dzí be má <u>**keep**</u>-é <u>**away from**</u> Eun...
FOCUS 1S-want COMP 1S.FUT keep- 3s away from Eun...
'I had wanted to keep it away from Eun...'

If and how an EL indirectly-elected preposition is realized in CS depends on the ML. Because the ML determines the larger grammatical frame of the clause, there may be other requirements of the ML to be considered, and some of these may interact with the choice of language of the early system morpheme. This may mean that a preposition is realized in the ML, even if the verb is in the EL. In (18), for example, a Xhosa preposition *ku* occurs with the EL verb *depend.* Because prepositions integrate nominals into larger clausal structure, they can also interact with the morphological requirements of the nominals they govern. In Xhosa, a nominal is integrated into the Bantu noun class system with prefixes; this means that in a prepositional phrase, the nominal prefix can cliticize on the preposition. Note that in (18), the *i-* agreement prefix on the noun *situation* cliticizes onto locative preposition *ku.*

(18) Xhosa-English (Myers-Scotton, 2005b)
but i-**depend**-a kwi-**situation** e-ndi-ku-yo
but CL9-depend-FV LOC.CL9-situation REL-1SG-BE-REL
'But it depends on the situation which I am in'

The realization of the indirectly-elected early system morpheme in the ML preserves the ML frame in a semi-calque construction. In post-apartheid Xhosa-English contact, examples like this suggest there may be some convergence of the ML frame to the EL, especially since in Xhosa, verbs do not usually occur with prepositions to realize this type of thematic structure projected by the verb. In examples like (18), an applied suffix on the verb (*-el-*) would prototypically occur with a nominal object in Xhosa. While at one level the lexical-conceptual structure of the EL verbal construction affects the grammatical frame of the ML (a more English-like V + PP as opposed to a more Bantu-like V-suffix + NP), the late system morphemes all come from the ML, Xhosa.

In a similar Palestinian Arabic-English example in (19), the ML preposition is inflected with a clitic object pronoun (*-ih*). Only the verb comes from English, the EL. The occurrence of the Arabic preposition with a clitic suffix, an outsider late system morpheme, maintains the ML grammatical frame, and is consistent with the EL verb inflected with ML agreement and tense/aspect morphology. Elsewhere we discuss how the verbal inflections of Arabic more narrowly constrain the grammatical structure of predicates in Arabic-English CS (Myers-Scotton & Jake, 2001).

(19) Palestinian Arabic-English (Okasha, 1998)
lamma biyeeji waħed jideed bin-**gang** 9alaih
when HAB.IMPF.3M.come one new HAB.IMPF.1PL-gang on.3M
'When someone new comes, we gang [up] on him'

Example (19) illustrates how the requirements of the ML limit the options of the indirectly-elected preposition. The Haitian Creole-English example in (20) below illustrates another option: the verb plus its indirectly-elected preposition are realized in the EL, English, as is the clitic object *it*.

(20) Haitian Creole-English (Hebblethwaite, 2007: 113)
... m ka **break it down**
'... I can break it down.'

According to the requirements of the ML, Haitian Creole, the clitic would be preverbal. But according to the EL verb and preposition, a separable two-word verb, the object clitic occurs between the verb and preposition. The realization of the entire VP in the English illustrates another way to resolve the conflict between calling an EL verb plus preposition collocation, *break down*, and the placement of an object clitic.

EL prepositions as bridge system morphemes

Bridge system morphemes provide hierarchical structure to conceptual structure; bridge prepositions do not determine the thematic role of their complements, as is illustrated by the well-known thematic underspecification of the complement of *of* in nominalizations such as *the destruction of the army* (*the army* can be interpreted as agent or patient in this nominalization). Bridge system morphemes are generally from the ML although some EL bridge prepositions occur in mixed constituents, if there are no additional requirements from the ML that must be satisfied. However, we predict that, in general, bridge prepositions are less likely to switch than prepositions that are conceptually-activated because bridges are called at the level of the formulator to build constituent structure, and, as such, they preserve the structure of the language of the larger grammatical frame, i.e., the superordinate constituent, which is calling them, usually the ML. For example, in Acholi-English CS, bridge prepositions typically come from the ML, Acholi, as in (21). In Myers-Scotton's corpus, 42 associative constructions with at least one NP from English include the Acholi associative marker *me*; an English bridge occurs in only one formulaic EL island (*cost of living*) (Myers-Scotton, 2002).

(21) Acholi-English (Myers-Scotton, 2005c: 12).

Chances	<u>me</u>	**accident**	pol	ka	i-**boarding**	**taxi**
Chances	ASSOC	accident	many	if	2s-board	taxi

'[The] chances of [an] accident [are] many if you board [a] taxi.'

Although we predict that prepositions that are bridge system morphemes are more likely to occur in the ML, that bridge prepositions can come from the EL is some data sets is clear, but it is also clear that this depends on features of both the ML and the EL. For example, Bentahila and Davies (1992) note that in Moroccan Arabic-French CS, *djal* 'of' occurs in clauses framed by French.

(22) Moroccan Arabic-French (Bentahila & Davies, 1992: 450)

walakin	ça dépend	de quel degré de connaissance	<u>**djal**</u>	la personne...
but	that depends	on the degree of knowledge	of	the person...

Ziamari (2003) finds the same in her Moroccan Arabic-French data. When French is the ML, there are 24 occurrences of *dyal* (*djal*). In (23) the bridge preposition integrates a mixed NP; Arabic, the EL, provides a demonstrative, while the rest of the definite NP occurs in the ML, French. In some of her examples, the preposition *dyal* is inflected with an agreement suffix to create a possessive pronoun; see *-k* in (24). The two EL morphemes together form a constituent, although it is not a canonical PP with a P and a separate NP complement. Still, it is a PP EL island. We would note that under the assumptions we make regarding clitic pronominal elements, the outsider agreement suffix on *dyal-k* co-indexes and agrees with a referent in the larger discourse, which may be a null.

(23) Moroccan Arabic-French (Ziamari, 2003)
je guarderai les séquelles **dyal** **dak** l'échec
'I will keep the after-effects of this [the] failure'

(24) Moroccan Arabic-French (Ziamari, 2003)
la voix **dyal-k** na pas changé
'Your voice didn't change'

While Moroccan Arabic *dyal* is congruent with the French partitive *de,* the grammatical structure of the complement of *dyal* occurs in more contexts to preserve definiteness. For example, in (23), the added definiteness of the demonstrative *dak* co-occurring with a definite noun (*l'échec*), is realized only when the partitive preposition is from Arabic. Similarly, both possessive and definiteness are realized independently in (24) because the pronominal clitic can occur on the Arabic preposition; in French, 'your voice' would be *ta/vôtre voix*. Examples (22) – (24) illustrate that French and Arabic partitives are largely congruent, but the specific structures they govern are not. In Moroccan Arabic, definiteness co-occurs with other related referential and deitic features, demonstrative or possessives, a factor that may promote occurrence of an EL bridge system morpheme preposition. Elsewhere, we discuss the occurrence of Moroccan Arabic *dyal* in terms of Johanson's notion of 'attractiveness' (Johanson, 2002, in Jake & Myers-Scotton, 2009). While the ML is French, the identity of the Moroccan Arabic bilinguals may promote fuller realization of the semantic and pragmatic features underlying definiteness; this may make the occurrence of a bridge system morpheme from the EL more attractive than the occurrence of its ML counterpart.

Prepositions as outsider system morphemes

Some prepositions are late outsiders. Recall that the function of outsiders is to coindex relations that hold across phrase and clause boundaries; their form depends on information outside of the phrasal constituent in which they occur. In bilingual constituents, the prediction is that these will not come from the EL in classic CS, in line with the MLF model. In (25), the ML supplies the Spanish preposition *a* that also marks the object as animate human. Such outsiders must come from the ML in a mixed constituent.

(25) Spanish-English (Jake, Myers-Scotton, & Gross, 2002: 81)
Pero tú te refieres a tus **coworkers**...
but you 2.S.REFL refer 2.S.PRES to 2.P.POSS coworkers
'But are you talking about your coworkers...?'

Late outsider prepositions come from the ML in mixed constituents, as in (25) above. We predict that they will occur in the EL only in an EL island. PP EL islands have been observed in English-Spanish CS, as in (26) below. The Spanish PP occurs where an NP would occur in English.

(26) English-Spanish (Moyer, 1992: 196)
they invite **a el boss** and then they don't keep their word
'they invite their boss and then they don't keep their word'

Yet, even the occurrence of EL islands with late outsider SM prepositions is predicted to be infrequent. If the ML also overtly marks case on the construction in question, an EL island with a late outsider SM preposition is unlikely to occur, because of the requirements of the ML (Myers-Scotton, 1993;1997: 120–121). Instead, a bilingual PP constituent, with the late outsider preposition from the ML, or the entire PP in the ML, with the requisite late outsider system morphemes occurs.

EL prepositions in CS: A summary

A review of the CS literature on the distribution of EL prepositions supports the predictions of the principles about the distribution of EL prepositions in CS. As predicted by the Uniform Structure Principle and the Differential Access Hypothesis, conceptually-activated EL prepositions, content morphemes and early system morphemes, occur more frequently than structurally-assigned EL prepositions, bridges and outsiders. As predicted by the System Morpheme Principle of the MLF model, no EL outsider system morphemes occur in mixed constituents. Further, as predicted by the Uniform Structure Hypothesis, few EL islands with outsiders occur. These findings support the Morpheme Sorting Hypothesis.

Morphemes between clauses

Complementizers, other subordinators, and coordinating conjunctions.

We now turn to the predictions for complementizers and other morphemes marking clause boundaries in classic CS. Such morphemes allow one clause to be connected with another clause to create larger constituents, i.e., multi-clausal constituents. Subordinators fall into two categories. Complementizers morphosyntactically integrate clauses such as complement clauses or purpose clauses (e.g., *that* clauses or *for-to* nonfinite clauses in English). Other subordinators are adverbial and add subordinate clauses that add thematic structure to the thematic grid of the matrix clause. CS involving adverbial subordinators is discussed below.

Coordinating conjunctions join independent clauses, and sometimes occur as single morphemes on independent clauses to integrate the clause into the larger discourse structure. CS involving coordinating conjunctions is discussed below. Next, we illustrate how language specific constraints on subordinators and coordinators influence what can occur in CS. Finally, we look at CS involving '*that*-type' complementizers.

Subordinating adverbs as content morphemes

Under the 4-M model, many subordinators are content morphemes. As such, they can and do come from the EL as well as the ML. These morphemes contribute thematic structure in two ways. First, as noted above, adverbial subordinators, such as *because,* spell out the thematic role (e.g., reason or cause) an embedded clause receives as a constituent of a higher clause, i.e., how the clause fits into the thematic grid of the matrix clause. In this sense, some subordinators are like prepositions, and in fact, some are (e.g., *before, after*). They expand the thematic grid of a matrix clause. However, unlike regular prepositions, adverbial subordinators assign their thematic roles to a clause, not a noun phrase. Second, many elements that mark clause boundaries also convey procedural knowledge (Blakemore, 2002; Wilson & Sperber, 1993). Such elements assign thematic roles at the discourse level and clarify how a subordinate clause fits into the propositional content of a larger grammatical structure (the matrix clause) as well as the more general discourse structure. We return to this notion of discourse thematic structure below.

Evidence that subordinators are content morphemes is that the clause they introduce can be questioned, and they introduce answers to questions: ***Why** did he leave?* ***Because*** *he was late.* ***When*** *did he leave?* ***After*** *the rain stopped.* Notice this is distinct from early system morphemes, whose semantic and pragmatic features further realize speakers' intentions already directly realized through directly activated morphemes. Consider the contrast between the two answers to the question ***where** did he throw the ball?* ***Over there*** is a felicitous response, but ***away*** is at best impudent, or an instance of non-parallel syllepsis. Elsewhere we have discussed this heuristic test for content morphemes. Some English pronouns are content morphemes; these can be questioned, as in ***Who** will work?* ***They** will.* Compare *it* in ***it**'s raining*; ***what**'s raining?* is infelicitous (Myers-Scotton & Jake, 1995; 2000).

While there may be language-specific factors influencing the language of the subordinator, in many language pairs, the possibility that subordinators can occur with clauses entirely in the other language is predicted. See examples (27) – (33). Example (30) is interesting because the first occurrence of *pa'que* [*para que*] ('because') introduces an English clause, and the second occurrence introduces a Spanish clause.

(27) Spanish-English (Pfaff, 1979: 312)
trabajé menos <u>porque</u> **then I didn't know some of his business**
work.PRET.1s less because then I didn't know some of his business
'I worked less because then I didn't know some of his business'

(28) Spanish-English (Pfaff, 1979: 312)
Como here you can <u>because</u> **viven todos juntos**
'Like here you can because [they] live altogether'

(29) Xhosa-English (Myers-Scotton, 2005b)
<u>**after**</u> e-bhubh-il-e, nd-a-ba-**depressed**
after 3SG-die-PAST-FV 1SG-PAST-be-depressed
'After he died, I was depressed'

(30) Spanish-English (Poplack, 1980: 589)
Why make Carol **sentarse atras <u>pa'que</u>** everybody has to move **<u>pa'que</u> se salga**
'Why make Carol sit in the back so [that] everybody has to move for her to get out?'

(31) Xhosa-English (Myers-Scotton, 2005b)
... nje <u>**before**</u> ndi-cel-e i-nto **I always talk to God**...
... thus before 1s-ask-PAST-FV CL9-thing I always talk to God
'... thus, before I asked for [a] thing, I always talk to God...'

(32) Haitian Creole-English (Hebblethwaite, 2007: 158)
ma pa bezwen <u>paske</u> **it's just like**...
'I don't need [it] because it's just like... '

(33) Haitian Creole-English (Hebblethwaite, 2007: 225)
Because m konnen **that** m ser lajan m...
'Because I know that I save my money...'

Coordinating conjunctions as content morphemes

In the codeswitching literature, there are many examples of conjunctions from one language introducing a clause from another. According to the 4-M model, most conjunctions are conceptually activated, conveying procedural as well as semantic and pragmatic knowledge. That is, they are content morphemes. As was the case with subordinating conjunctions, unless there are language specific factors influencing the form of the conjunction, the possibility that EL conjunctions can introduce a clause in the other language is predicted. This prediction is confirmed. See examples (34) – (37).

(34) Xhosa-English (Myers-Scotton, 2005b)
... ba-se-msebenzi-ni **and** umalume be-ka-khal-a kude ku-na-thi...
... 2.PL-LOC-work-LOC and my.uncle PST.REL-stay-FV far LOC-have-us...
'... they were at work and my uncle lived far from us...'

(35) Xhosa-English (Myers-Scotton, 2005b)
And ndi-mithi
and 1sg-pregnant
'And I'm pregnant' (in response to a hypothetical question about rape and abortion)

(36) Chichewe̥-English (Simango, 1996)
Inde, I know what you mean, **koma ine** how do I know, **kuti**...
Yes, I know what you mean, but I, how do you know that...?
'Yes, I know what you mean, but how do I know that...'

(37) Palestinian Arabic-English (Okasha, 1999: 112)
I would like to wear this dress **bas** my parents won't let me.
'I would like to wear this dress but my parents won't let me.'

(38) Spanish-English (Pfaff, 1979: 312)
No voy tanto como iba pero **I still believe in it, you know**
'I don't go as much as I went but I still believe in it, you know'

(39) Spanish-English (Pfaff, 1979: 312)
Me estaba defendiendo **and then he split**
'He was defending me and then he split'

Example (38) contrasts with (39); it illustrates that in some language pairs, the choice of language for the coordinating conjunction is free; it can come from the language of the preceding or following clause. Coordinators can also introduce an independent clause, as in (35), not just connect one clause to another. Such a coordinator shows how the clause is integrated into the larger discourse, and like an adverb, it expresses semantic and pragmatic features such as contrast or addition, and it is in this sense that they convey procedural knowledge. That coordinating conjunctions and subordinating conjunctions are thematically salient is also suggested by the fact that they serve as nominals as in the well-known phrase *no **ifs**, **ands**, or **buts**.*

Constraints on EL subordinators and coordinators: The special case of Arabic.

As discussed above, subordinators and coordinators that are conceptually-activated are predicted to occur in either language participating in codeswitching. However, in some languages, there are specific grammatical requirements imposed by the ML of the matrix clause or that integrate the subordinators into the following clause. In Arabic, for example, many subordinators include clitic pronouns that overtly coindex the subject of the subordinate clause, and an Arabic subordinator can introduce a subordinate clause entirely in English, as in (40) and (41). In these examples, the subordinator includes a clitic pronominal copy of the lower clause subject. This reflects Arabic as the base language of the discourse, and means that in such corpora, in most of the discourse, Arabic is the ML of most clauses.

(40) Palestinian Arabic-English (Okasha, 1998)
[...] huma biyidfa9ooli kul haga li?anuhum **they can afford it**
[...] they HAB.IMPF.3P.pay.1S every thing because.3PL they can afford it
'they pay for everything (for me) because they can afford it'

(41) Palestinian Arabic-English (Okasha, 1998)
hunak biniħki aktar li?annu **we get in the mood**
there HAB.IMPF.1PL.speak more because.1PL we get in the mood
bas hooni **it is difficult**
but here it is difficult
'there we speak more because we get in the mood but here it is difficult'

The analysis of examples like (40) and (41) is problematic. If the subordinator is a constituent of the subordinate clause, then the ML of the subordinate clauses is English, and the conceptually-activated subordinator comes from the EL. The subordinators occur with late system morphemes from the EL, the clitics agreeing with the subject of the subordinate clause, and as multi-morphemic EL units, form

EL islands, well-formed constituents entirely in the EL. An alternative analysis might maintain that Arabic is the ML of the subordinate clause as well as the main clause; in that analysis, the English constituent of the subordinate clause is a very large EL island, an IP EL island. This analysis is attractive because it allows the ML features of main clause and the subordinator of the subordinate clause to transition the switch to the EL for an island (See Myers-Scotton and Jake, 2001).

Example (42) illustrates another way that structures marking clause boundaries in Arabic-English CS maintain Arabic as the base language of the discourse, even if the ML of the connected clauses is English: coordinators and subordinators that do not include a pronominal clitic coindexed with the subordinate clause subject occur with a pronominal emphatic pronoun copy of the subordinate clause subject. (See also similar findings in Eid, 1992.)

(42) Palestinian Arabic-English (Okasha, 1998)
I prefer warm weather, **lakin** **ana** I wouldn't move to Florida
I prefer warm weather, but I.EMPH I wouldn't move to Florida
'I prefer warm weather, but, me, I wouldn't move to Florida'

Complementizers as bridge system morphemes

Different pairs of languages reflect different options regarding the occurrence of bridge Comps. Under the 4-M model, '*that*-type' complementizers are bridge system morphemes. In some sense, bridge Comps are prototypical bridges because their primary function is to connect clauses and thus convey procedural knowledge. In contrast with subordinating conjunctions, they do not add any specific structure to the thematic grid of either the matrix or the subordinate clause. Instead, how the complement clause fits into the thematic grid of the matrix clause depends on the semantic properties of the matrix clause, not on the semantic properties of the complementizer itself. For example, factive complements receive their thematic role from the matrix clause, as in *discover* or *resent that X.*

While the System Morpheme Principle of the MLF model does not block EL bridge complementizers in CS, the Uniform Structure Principle preferences ML structure-providing options in CS. This means that although bridge Comps can occur from either language in CS, unless there are factors preferencing the EL of a particular subordinate clause, bridge Comps are more likely to come from the ML than the EL. We predict that different contact situations reflect different options for bridge Comps.

Examples (43) and (44) show that in Spanish and English, the bridge Comp can be in the same language as the complement clause or in the other language.

Example (45) illustrates the base language effect of bridges; Pfaff (1979) refers to this as the solidarity marking function of these discourse elements.

(43) Spanish-English (Belazi, et al., 1994: 234)
El professor dijo **<u>that</u> the student had received an A**
'The professor said that the student had received an A'

(44) Spanish-English (Pfaff, 1979: 312)
They sell so much of it <u>that</u> **lo están sacando y** many people...
'The sell so much of it that they're taking it out and many people...'

(45) Spanish-English (Pfaff, 1979: 314)
'It goes without saying I think **<u>que</u>** ['that'] along with the picketing we are doing a boycott'

It is also necessary to consider grammatical differences in the distributions of bridge Comps across languages. In some languages, bridge Comps are optional, such as English *that.* In other languages, the bridge is always required. This is the case in Arabic and Chicheŵa. In CS with Arabic or Chicheŵa, bridge Comps always come from these languages if they are the ML of the first clause, and the dominant ML in the discourse. In the Chicheŵa-English example in (46), the bridge comes from Chicheŵa. A particularly interesting example is (47); in this example, tension between a child and a parent is resolved in favor of Chicheŵa, the parents' ML for the discourse. This example also illustrates how *kuti* conveys procedural knowledge, knowledge one speaker uses to match the response to the WH-expression of the preceding turn.

(46) Chicheŵa-English (Simango, 1996)

… mpaka	**at least**...	a-ka-tsimikiz-e	<u>kuti</u>	**this was the end**
… until	at least...	3s-CONSEQ.confim.FV	that	this was the end

'… until at least... he confirms that this was the end'

(47) Chicheŵa-English (Simango, 1996)
Parent: ndiya kutanthaauza chiyani
'what does that mean?'
Child: '**<u>kuti</u>** you should sign it before I cut the whole of it. That's all.'

Examples (48) and (49) below illustrate bridge system morphemes introducing Arabic complements that are coindexed with the subject of the complement clause, as is the case with some subordinators (see (40) and (41) above). This means the bridge is really a multi-morphemic form, composed of a bridge and a late outsider system morpheme. As such, bridge Comps come from Arabic if the complement is bilingual, as in (48), and also can introduce a complement clause entirely in English, as in (49) and (50). English is the language identified as the EL in bilingual clauses in this discourse; the occurrence of Comps and other clause connecting elements in Arabic provides structural elements at the discourse level to mark the status of Arabic as the base language, even when English is the ML of some monolingual clauses, as in (49) and (50).

(48) Palestinian Arabic-English (Okasha, 1999: 72)
ma ba9ti?id <u>?innik</u> **worried** bas?inti **curious**
no HAB.IMPF.think.1s that.2F worried but you curious
'I don't think that [you are] worried, but you [are] curious'

(49) Palestinian Arabic-English (Okasha, 1999: 71)
kaan el-**doctor** yišuk <u>?innu</u> **it is not reliable**
PERF.3M.BE the-doctor IMPERF.3M.doubt that.3M it is not reliable
'[he] was, the doctor, doubting that it was not reliable'

(50) Palestinian Arabic-English (Okasha, 1998)
Mneeh <u>?inn-ek</u> **you are doing something you like**
good that-2M you are doing something you like
'[it is] good that you are doing something you like'

Comp elements as late outsider system morphemes

The prediction that comes from the principles constraining morpheme type distributions is that the ML supplies singly-occurring late outsider system morphemes that are Comps, other subordinators, and coordinators. In some of the examples examined above, late outsider system morphemes from the EL do occur, but not as singly-occurring morphemes. They occur on content morphemes or bridge system morphemes in well-formed EL islands in Arabic-English CS. The principles make similar predictions for other constructions, such as comp elements that are themselves late outsider system morphemes in multi-morphemic elements. For example, the Swahili subordinator, *i-si-po-kuwa* 'when' is a fossilized inflected verb ('CLASS.9-IF-WHEN-COPULA'), and only occurs in clauses framed by Swahili, as in example (51). The null expletive subject and missing copular main verb (distinct from the relic of 'be' in the subordinator itself) satisfy a Swahili ML frame, but not English.

(51) Swahili-English (Myers-Scotton, 1988)
<u>i-si-po-kuwa</u> **too much rain**
'unless [there is] too much rain'

Examples like (51) in which outsider late system morphemes occur as part of a multi-morphemic element are similar to the subordinating and coordinating conjunctions in Arabic CS. In both types of cases, the Comp element constrains the language of the outsider.

Summary of the distribution of EL elements between clauses

The distribution of EL morphemes functioning as complementizers, other subordinators, and coordinators reflects the 4-M model and the Uniform Structure Principle. EL Comps can occur in bilingual clauses, as long as they do not include an outsider SM. However, as is illustrated by the case of Arabic, some EL subordinators can be inflected by an outsider SM to form an EL island. We noted that in general, EL bridge complementizers appear to occur more frequently than EL bridge prepositions. We suggest that this is because complementizers link clauses, and their language specific morphosyntactic requirements can be largely satisfied within the Comp phrase (or the subordinate clause adjoined to Comp). In contrast, bridge prepositions connect two elements within a phrase that must satisfy the requirements of the ML of the clause.

Composite CS: No outsider late system morphemes

Thus far, we have illustrated how the distribution of morpheme type for two lexical categories, prepositions and morphemes that connect clauses, supports the predictions of the System Morpheme Principle, the Morpheme Sorting Hypothesis, and the Uniform Structure Principle. These distributions reveal the two asymmetries of classic CS, the ML-EL asymmetry and the asymmetry between conceptually-activated and structurally-assigned morphemes. Our examples have come from classic CS, that is, CS in which each constituent is framed by a single language, and CS in which only one of the participating languages frames each bilingual clause and bilingual constituent. We now illustrate how these predictions can be applied to prepositions and elements that connect clauses in bilingual clauses with composite CS. In composite CS, both participating languages contribute abstract structure, as in convergence, and also surface forms. This means that the MLF model alone does not account completely for composite CS because it is based on the premise that only one language supplies the abstract morphosyntactic frame. Below, we analyze examples that illustrate that even in composite CS, EL outsider system morphemes do not occur, except in EL islands.

Examples of composite CS

Under composite CS, there can be convergence in the internal structure of the lemmas supporting ML and EL morphemes. That is, they are open to splitting and recombining, as outlined in the Abstract Level model (Myers-Scotton, 2002; Myers-Scotton & Jake, 2001). This means that in composite CS, there is abstract structure from the EL in bilingual constituents, not just overt EL morphemes, and this abstract structure can contribute to the morphosyntactic frame. Yet, the Morpheme Sorting Hypothesis still makes predictions for composite CS. While other types of system morphemes may occur, outsider late system morphemes will not.

Example (52) illustrates composite CS, that is, CS in which there is also abstract structure from the EL. While the EL may contribute to the grammatical frame at the abstract level, it does not contribute late outsider system morphemes. King (2001) reports many examples of English prepositions in Prince Edward Island French, but none are outsider system morphemes. They occur in calques and sometimes involve reanalysis, as in (52), where *back* is reanalyzed as part of a phrasal verb with the meaning 'again'. There is even stranding of French prepositions, as in (53), reflecting convergence in the level of morphological realization patterns, but the overt form of the preposition comes from the ML.

(52) Prince Edward Island French (King, 2001: 131)
je viendrai **<u>back</u>** á ça
'I will come back to that'

(53) Prince Edward Island French (King, 2001: 131)
Où ce-quelle vient <u>de</u>?
'Where that she come from' / 'Where does she come from?'

Quichua-Spanish composite CS

We consider two examples illustrating considerable convergence and composite CS involving prepositions and clause boundary elements (complementizers and subordinators); still, in these example, all late outsider system morphemes still come from the original ML, Imbabura Quichua. This example comes from a collection of folktales from one speaker in Imbabura Province, Ecuador. Muysken (1997) refers to similar composite varieties from other areas of Ecuador as Media Lengua; around Otavalo this mixed variety is referred to as Chaupi Lengua ('half language').

In Chaupi Lengua, Spanish contributes not only surface forms, but also aspects of the abstract grammatical frame. The most obvious contributions from Spanish in (54) are content morphemes. For example, a Spanish verb (*sucede*- 'follow', 'succeed') and noun (*culebra* 'snake') occur. Also, in the subordinate clause with the verb *ri-shca* (go-past.nominalizer), the Spanish subordinator *porque* ('because') occurs instead of the expected Imbabura Quichua postposition *manda* or *raycu*, an early system morpheme postposition. Notice that in the bilingual example, the word order of the *porque* clause is subject-verb-complement (clause), although Quichua is verb final. A monolingual Imbabura Quichua equivalent example (55) follows the example. (In these examples, subordinate clauses are bracketed:

Quichua verb-final structures result in center-embedded subordinate clauses; adverbial and purpose clauses are frequently extraposed.)

(54) Imbabura Quichua-Spanish Chaupi-Lengua (Jake, 2001)
cai **sucedi**-ju-shca [**porque** cai **culebra** ri-shca
this happen-PROG-PAST because this snake go-PAST
[chai mai-pi yacu tiya-n] [causa-ngapac]]
that where-LOC water BE-3PRES live-PURP.COREF
'this was happening because the snake went to where there was water in order to live'

(55) Monolingual Imbabura Quichua equivalent:
cai tucu-shca-mi [cai amaru [mai-pi-pash yacu tiya-shca-man]
this happen-PAST-VAL [this snake [where-LOC-ALSO water EXIST-PAST/NOMIN-DAT]
ri-shca-manda/raycu [causa-ngapaj]]
go-PAST/NOMIN-ABLA/CAUS] live-PURP.COREF

A comparison of this bilingual example with the monolingual Imbabura Quichua equivalent (55) shows how Spanish also contributes to the abstract structure. For example, the verb *tiya-n* ('exist-3PRES') in the subordinate existential locative clause is finite, as it would be in a Spanish equivalent clause. But in Quichua, subordinate clause verbs are non-finite. The expected form is the verb stem plus one of four nominalizing suffixes, and no agreement: *tiya-shca-* ('exist-PAST.NOMIN'). Further, a postposition would indicate how this subordinate clause is integrated into the lexical-conceptual and predicate-argument structure of its matrix clause. The expected postposition is the dative/allative *-man* (to). In the bilingual example, the locative *-pi* on the question word *mai* 'where' appears to mark both the locative within the clause ('where there is water') as well as the clause as a directional goal. In Spanish, the Wh-expression would convey the notion of goal, as in *a donde* 'to where'.

This example illustrates convergence and composite CS. Although two Quichua system morphemes are omitted, the ablative/cause suffix in the *porque* reason clause and the dative in the directional locative, Quichua continues to provide all late outsider system morphemes. Thus, while Spanish influences the abstract grammatical structure, it only provides content morphemes.

Example (56) also illustrates Imabaura Quichua-Spanish composite CS and convergence. A Spanish coordinating conjunction *y* 'and' and a disjunctive conjunction *pero* 'but' occur. Also, a Spanish multi-morphemic quantificational-prepositional comparative construction *mas de* 'more than' occurs. In Quichua, a postposition on the verb of the conjoined clause (*-pash* 'and', 'also') would convey conjunction; see the monolingual Quichua equivalent in (57). Disjunction is often a more syntactically complex construction in Quichua; an emphatic adverbial (*shi-na-lla-taj*) plus a negative (*[ma]na* 'no', 'not') and the requisite negative verbal post-position (*-chu*) in the disjunctive clause are required. Also of interest is the comparative construction in Quichua. The measure or standard of the comparative is the object of the verb *yali-* 'pass'. The result is a headless relative clause with what would be the subject in Spanish occurring as a surface object in Quichua; *runa* 'people/person' occurs in accusative case, suffixed with *-ta*. The lack of morpho-syntactic transparency of the semantic-pragmatic Quichua comparative structure contrasts with the greater transparency of the Spanish comparative construction.

Still, of note, is what Spanish can contribute to this example of composite CS and what it cannot. Overtly, it contributes a comparative construction with an early system morpheme quantifier *mas* and a bridge preposition *de*. It also contributes two coordinating conjunctions, *y* and *pero*. More abstractly, in the comparative construction, there is syntactic simplification; two main clauses occur in (56), but in (57), there is a headless relative clause within the first main clause. Further, the occurrence of clause initial conjunction *y* appears to trigger an inversion word order of the first clause, with the subject following the verb *ri-rca* 'went', as would be common in Spanish intransitive (unaccusative) constructions. However, Quichua provides subject-verb agreement on both finite clauses (here 3S/PL is null) in (56).

(56) Imbabura Quichua-Spanish Chaupi-Lengua (Jake, 2001)
y ri-rca **más de** pichag **persona-s**-cuna **pero** na tigra-rca-chu
go-FIN.PAST more than five people-PL-PL but not return-FIN.PAST
'and more than five people went but did not return'

(57) Monolingual Imbabura Quichua equivalent:
[picha runa-ta-ca yali-y] ri-rca-pash-mi shina-lla-taj
five people-ACC-TOP pass-NOM go-FIN.PAST-ALSO like-JUST-EMPH
na tigra-rca-chu
NEG return-FIN.PAST-NEG.VAL
'some, exceeding five people, went, but just did not return'

Elsewhere, we have discussed the frequent occurrence of Spanish complementizers (especially *que* 'that'), subordinators, and coordinators in terms of attractiveness (Jake & Myers-Scotton, 2008). First, these Spanish morphemes are singly-occurring morphemes, and more salient than affixes. Further, the clause initial position of the Spanish discourse elements makes the clause boundaries more salient and may also reduce cognitive load by resulting in fewer center embeddings. Further, the switching of these markers is itself a saliency-enhancing strategy. Still, it is of note that Spanish complementizers, subordinators, and coordinators fail to completely subvert the Quichua grammatical frame. They may shift the word order and occur in place of thematic-role marking case suffixes, as in (54), and they affect the finiteness of subordinate clauses, also in (54), but the coindexing of nominals and their predicates remains in the original ML, Quichua. The Uniform Structure Principle essentially blocks outsider system morphemes from more than one language within a single clause.

Conclusion

This discussion of the empirical distribution of two lexical categories, EL prepositions, and morphemes connecting clauses (complementizers, other subordinators, and conjunctions) in the CS literature supports predictions that follow from the Asymmetry Principle, the Uniform Structure Principle and the categorization of morpheme types in the 4-M model. As we would predict, the most frequent EL morphemes are content morphemes, whether they are prepositions or subordinators. The second most frequent EL morphemes are one type of early system morphemes, satellite prepositions with phrasal verbs. By another name, these early system morphemes are one sub-type of derivational morphemes. To reach these conclusions, we surveyed the CS literature, but few of these corpora include quantified data. These findings make predictions for studies that lend themselves to meaningful quantitative counts.

Bridge system morphemes that are prepositions do not occur frequently from the EL, even though there are examples of corpora in which they are robust (e.g., Moroccan Arabic *dyal*). In most CS corpora, associative elements, which are prepositions, come only from the ML. This is demonstrated very dramatically in an Acholi-English data set in which there are many NP + associative + NP phrases in which both NPs are from English, but the associative marker *me* is from Acholi, the ML of the clause.

In contrast, EL bridge system morphemes that are '*that*-type' complementizers show more freedom of occurrence, as we have noted. A reason for this is the difference in their patterns of occurrence in contrast with that of bridge prepositions. Bridge Comps link what can be considered full clauses whose ML morphosyntactic requirements can be largely satisfied within each clause, while bridge prepositions are embedded in a phrase which must satisfy the requirements of the ML of the clause framing the resulting larger NP. However, we noted that in CS involving languages in which bridge Comps have more restrictions on their occurrence, typically only one language provides the bridge Comp, the language with greater restrictions. We suggested this preferencing of the more restricted Comp, and the fact that such Comps are obligatory, is connected to a base language effect.

Finally, in line with what the Asymmetry and Uniform Structure Principles and the Differential Access Hypothesis predict, no outsider system morphemes from the EL occur in mixed constituents. This is expected for several reasons. Because empirical evidence shows that the ML does provide the grammatical frame for mixed constituents, this suggests that the ML must be more active than the EL when directions to the formulator in language production produce the relevant morphosyntactic structures. Also, uniformity is maintained if they all come from the ML. Finally, according to the Differential Access Hypothesis, this is the point in language production when late system morphemes are activated. (Of course late system morphemes could come from the EL if they occur in EL islands, but there are reasons why this is dispreferred, and few reasons why such EL islands would be preferenced; the existing published data do not support this happening very often, if at all – a topic for another paper.)

We note that our approach to explaining what does and does not occur in naturally-occurring CS differs from the approaches of some other research, especially those who try to explain CS exclusively in terms of existing generative models. The argument is that the grammatical structure of CS can be explained without adding any new constructs to generative models – models that were devised for monolingual data. MacSwan, for one, states, "... all the facts of code switching may be explained just in terms of principles and requirements of the specific grammars used in each case, including principles and requirements of Universal Grammar" (2005: 69). Such researchers say that, in addition to being unnecessary, new constructs violate the goal of parsimony in explanatory models. We agree that parsimony is a virtue, but we argue it makes sense that bilingual data present a complication not found in monolingual data; that is, two systems of grammar are in contact. Even if we assume that they both operate according to the same universal grammatical principles, the issue remains – which language supplies the language-specific parts of the grammar of a bilingual clause? This is a necessary question, given that the ML can – and sometimes does – change across a corpus, or for the same participating languages when social context changes. We have argued in this paper that the issue of participation is resolved by asymmetry between the roles of the participating languages in bilingual clauses, and in the roles played by various morpheme types. Empirical evidence strongly supports this asymmetry.

A final consideration of the results of our analysis of CS data in this paper is that the connection between what occurs in the surface in CS across many language pairs is explained by the same abstract principles underlying language structure and the nature of abstract entries in the mental lexicon. That is, we argue that the distributional differences in the empirical data discussed here and the predictions we make are not primarily related to surface-level processes, such as possible insertions or alternations between the participating languages, or to typological distinctions.

Instead, their explanation begins with two underlying principles, the Asymmetry Principle and the Uniform Structure Principle. We have discussed asymmetry in CS; also, asymmetry is supported by distributions in other types of contact phenomena, for example, mixed languages (Myers-Scotton, 2003). In addition, asymmetry in bilingual data also follows from psycholinguistic experiments that imply differences in the activation of the participating languages. The Uniform Structure Principle most simply affirms a universal that holds for all language data, that a given constituent's structure remains the same whenever it occurs. As applied to bilingual data, the principle preferences the ML as the source of uniform structure, and this provision is supported by CS data. In sum, these principles, along with the Differential Access Hypothesis, suggest that explanations to surface-level distributions in CS lie in recognizing their abstract origins from asymmetries in language production.

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CHAPTER 10

Adjectives and word order

A focus on Italian-German codeswitching

Katja Francesca Cantone and Jeff MacSwan
University of Bremen, Arizona State University

We present original data of Italian-German codeswitching (CS) in DP-internal contexts. The findings suggest that basic word order for noun/adjective sequences is determined by the language of the adjective. An analysis of the findings is presented using MacSwan's (1999, 2000) Minimalist Approach to CS and Cinque's (1999, 2005) theory of DP-internal word order for Germanic and Romance. The research, part of the Ohio State University Workshop on Codeswitching, concludes with a discussion of potential interdisciplinarity in CS research for linguists and psychologists interested in psycholinguistic research on CS.

Keywords: Code switching, universal grammar, minimalism, noun/adjective sequences

Introduction

The study of codeswitching (CS) emerged in the sociolinguistic literature in the 1950s with a focus on the social motivation for CS (Vogt, 1954; Haugen, 1956), but soon gave rise to an independent literature concerned with the analysis of the grammatical structure of language mixing. Among the first to observe grammatical restrictions on CS were Gumperz and colleagues (Gumperz, 1967, 1970; Gumperz & Hernández-Chávez, 1970), Hasselmo (1972), Timm (1975), and Wentz (1977); these researchers noticed that while some switches naturally occur among bilinguals, others were non-occurring or judged to be ill-formed.

Research on the grammatical structure of CS has continued as a vibrant field into current times, culminating in recent work focused on constraint-free analyses of mixed-language data, explored more fully in MacSwan (1999, 2009). This line of work is concerned with both description and explanation, with the data of CS as well as the linguistic analysis of the data, undertaken in the context of a general theory of linguistic competence.

As the title of the volume conveys, we write to a broad interdisciplinary audience. We will therefore spend more time than usual explaining the details of our approach and analysis, but cannot, in the scope of a single chapter, do so without assuming, say, at least an *Aspects* (Chomksy, 1965) level acquaintance with syntactic theory. (For readers seeking additional background reading, we recommend Radford, 2004.) Furthermore, we will try our best to give special attention to those areas of historic tension between psychologically-trained and linguistically-trained psycholinguists, at times giving more than usual attention to basic assumptions taken for granted among linguists. A final section explores potential collaborative research among psychologists and linguists interested in CS, inspired by presentations at the Ohio State University Workshop on Codeswitching; we focus there on ways in which psycholinguistics interested in CS might engage in interdisciplinary research on specific topics drawing from both the linguistic and psychological sciences.

Narrowly, however, our focus here will concern adjective/noun word order in German-Italian CS, illustrated in (1) and (2). A switch from one language to the next is indicated by *italicized* text (with italics used for German, in our Italian-German examples).

(1) una *Gegend* fredda
a region cold

(2) la *schaufel* magica (Lukas, 3;1,30)
the shovel magic

CS of the sort shown in (1)-(2), in which an alternation occurs below sentential boundaries, is known as *intrasentential CS*, in contrast to switches between sentences, known as *intersentential CS*. Because grammatical theory is primarily focused on relations below the sentence level, research on grammatical aspects of CS has focused almost exclusively on intrasentential aspects.

Our main research question, then, is this:

Assuming a universal underlying word order for adjectival constructions, as has been proposed in recent research in syntax, how will linguistic properties relevant to determining surface word order be resolved in CS contexts involving languages with different basic word order requirements?

We begin with an outline of adjectives in two such languages, Italian and German, discussing recent work related to the explanation of word order differences in Romance and Germanic. We then provide a brief overview of previous treatments of adjectives, and, more generally, of mixes within the Determiner Phrase (DP) in the CS literature. We then outline our theoretical framework before turning to a description and analysis of our findings. In a final section, we provide some remarks on the applicability of the approach undertaken here to related questions in the psycholinguistic enterprise.

Adjectives in codeswitching

No clear description of the basic word order facts has yet emerged from studies of CS between languages with different basic word order requirements for adjectives. For example, Santorini and Mahootian (1995) survey a wide range of CS data involving adjectival constructions and showed that while the language of the adjective sometimes determines word order in CS contexts, constructions in which the language of the determiner appears to dictate word order have also been attested. Consider, for instance, the Adanme-English codeswitch in (3), reported in Nartey (1982), in which the Adanme determiner appears to impose noun-adjective word order on the English phrase *house red*.

(3) e hé *house red* ò
(s)he bought house red the
'(S)he bought the red house.'

Santorini and Mahootian (1995) analyzed (3) in terms of a Tree Adjoining Grammar (TAG) in which lexical items are stored with trees which give partial structure. In the grammar given by Santorini and Mahootian, an auxiliary tree corresponding to the word order requirements of Adanme adjectives is presented, but it is not lexically filled with an Adanme adjective; presumably another such tree exists to derive (monolingual, at least) English adjective-noun word order, also lexically empty. This leads to their generalization that all possible CS combinations are possible in noun/adjective contexts.

But this is a controversial claim. With respect to Spanish-English, for instance, Gumperz (1967), Lipski (1978), and Belazi, Rubin and Toribio (1994) claim that adjective/noun order is always determined by the language of the adjective; Poplack (1980) claims that the order is unconstrained; and Timm (1975) concluded that no adjective/noun switches were allowed. MacSwan (1999) similarly found that the word order requirements of the language of the adjective are preferred in Spanish-Nahuatl, though there, too, there appear to be complexities. Even confining the discussion to a small subclass of adjectives, as in Santorini and Mahootian (1995), the data are not clear.

Belazi, Rubin and Toribio (1994) analyzed CS by Tunisian Arabic-French and Spanish-English bilinguals. Tunisian Arabic allows only post-nominal adjectives, whereas in French (as in Spanish and Italian) some adjectives are pre-nominal. The authors propose the Word-Grammar Integrity Corollary which stipulates that a word and its morphological and syntactic features obey the constraints of the language from which it is drawn. The authors contend that a Tunisian Arabic adjective can appear after a French noun, being in its correct position, because French nouns allow adjectival modification from the right. By contrast, a pre-nominal French adjective cannot occur after a Tunisian Arabic noun.

In current approaches to syntax, adjectives and nouns are dominated by a Determiner Phrase (or DP). More broadly, research on mixes within the DP has addressed the role of morphological agreement within the DP. For example, Moro (in press) found that in mixed English-Spanish DPs, the determiner will only be provided by Spanish, as English has no gender feature encoded on the determiner. If D were English, following a feature checking account (Chomsky 1995, 2001), the gender feature of the Spanish noun could not be valued, given that the English determiner does not possess this feature. As a matter of fact, several studies have shown that in the language pair English-Spanish, mixes containing a Spanish D and an English N are preferred (e.g. Liceras, Fernández Fuertes, Perales, Pérez-Tattam & Spradlin 2008). Looking at mixed DPs in Italian and German, Cantone and Müller (2008) found that the language of the noun triggered the overt gender marking on the determiner, e.g., in a DP like *eine pentola* ('a pot'), the German determiner is feminine according to the requirements of the Italian noun, despite of the fact that the German translation equivalent is *topf* (masculine noun). The authors thus argue that gender is an inherent property of nouns.

In sum, while findings remain unclear in certain respects, a number of researchers have concluded that the language of the adjective determines the word order in adjective/noun CS contexts. We will assess this generalization further below with original data collected from Italian-German bilinguals.

Theoretical framework

The grammatical theory

Chomsky's (1965) *Aspects of the Theory of Syntax* extended the theory of transformational-generative grammar introduced in *Syntactic Structures* (Chomsky, 1957). The basic architecture of the grammar still consisted of a base component, comprised of a set of phrase structure (PS) rules which defined the deep structure or initial *phrase marker* (tree) representation, and a set of transformational rules which mapped phrase marker into phrase marker to generate a surface structure. In the *Aspects* model, lexical items were inserted into the terminal nodes of trees if their syntactic features matched those generated by PS rules.

The introduction of X' Theory in Chomsky (1970) set in motion a number of major changes, culminating with a radically lexicalist theory of grammatical structure. X' Theory effectively eliminated the PS component in favor of a system in which structures were projected from lexical items. However, remnants of the PS rule-based system endured, with reference to lexical insertion rules reasonably common in the era of Government-Binding (GB) Theory (Chomsky, 1981; Stowell, 1981; Lasnik & Uriagereka, 1988).

Apparent redundancies among various modules of grammar within the GB framework were troubling: Subcategorization, θ-Theory, and X' Theory all appeared to approach the same basic problems from a different angle, with none sufficient to manage the full array of issues associated with the base generation of an initial phrase marker. According to Chametzky (2003), the "lexical entry driven" approach to syntax was part of the general effort underlying X' reduction, with significant contributions from Stowell (1981) and Speas (1990), among others. With a return to its derivational roots, the Minimalist Program, representing the current instantiation of generative grammar, reduced generation to the simplest possible form – free *Merge* (Chomsky, 1991, 1994), building structures from the ground (the lexical string) up (the hierarchical phrase structure) based on the specification of lexically-encoded features. Independently, Borer (1984) had suggested an account of language variation in which parameters were also associated with the lexicon, rather than with the system of syntactic rules. Hence, the system of rules could be seen as invariant, with all variation associated with the lexicon, the traditional repository of arbitrariness.

In the Minimalist Program there are two components of grammar: C_{HL}, a computational system for human language, believed to be invariant across languages; and a lexicon, to which the idiosyncratic differences observed across languages are attributed. An operation called *Select* picks lexical items from the lexicon and introduces them into a *Numeration* or *Lexical Array* (LA), a finite subset of the lexicon used to construct a derivation. *Merge* takes items from the LA and forms new, hierarchically arranged syntactic objects. Movement operations (*Internal Merge*) apply to syntactic objects formed by *Merge* to re-arrange elements within a tree (Chomsky, 1995, 2000). Phrase structure trees are thus built derivationally by the application of the operations *Select* and *Merge,* constrained by the condition that lexically encoded features match in the course of a derivation.

Movements are driven by feature valuation, and may be of two types. A head may undergo head movement and adjoin to another head, or a maximal projection may move to the specifier position of a head. In either case, the element moves for the purpose of valuing morphological features of case and φ (number, person, and gender). In addition, its movement may be *overt* or *covert*. Overt movements are driven by *strong* features and are visible at PF (*phonetic form,* where they are pronounced) and LF (*logical form*, where they are interpreted). Covert movements, driven by *weak* features, are visible only at LF.

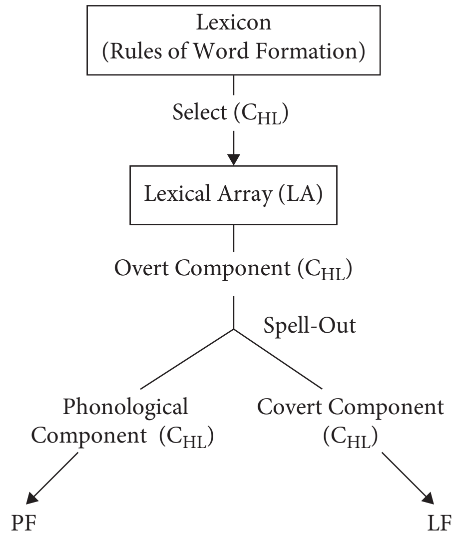


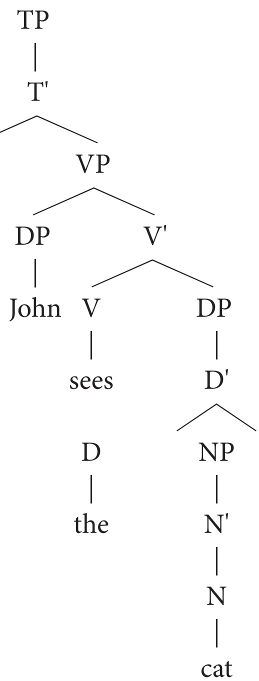
Figure 1. The minimalist framework

At some point in the derivation, an operation Spell-Out applies to strip away from the derivation those elements relevant only to PF; what remains is mapped to LF by a subsystem of C_{HL} called the *covert component*. The elements relevant only to PF are mapped to PF by operations unlike the covert component, operations which comprise the *phonological component.* The phonological component is also regarded as a subsystem of C_{HL}. The subsystem of C_{HL} which maps the lexicon to Spell-Out is the *overt component.* Note that the various components (overt, covert, phonological) are all part of C_{HL}, the computational system for human language. The model could be represented graphically as in Figure 1 (MacSwan, 2004).

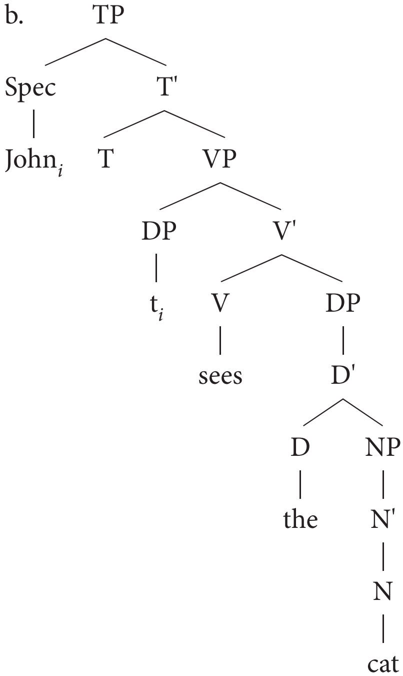
It may be helpful to consider some illustrations of how feature checking drives movement in the Minimalist Program. As mentioned, movement may be of two types: (1) a head (or X^0) moves by adjunction to another head, forming a complex X^0; or (2) an XP moves to the Specifier position of another XP. Movement is driven by a need to value features, and the configuration into which the element moves for feature valuation constitutes its *Checking Domain*.

XP movement is illustrated in (4). The tree in (4a) is formed by successive application of Merge, which uses lexically-encoded categorial features (V, N, D, T, …) to build a classical phrase structure representation. The subject bears a case feature. T is a nominative case assigner which attracts the case feature of the subject to its Specifier position, bringing the full DP along. Because case is an uninterpretable feature, it must be valued and deleted before LF, or the derivation will crash. Hence, the DP is attracted to T, and moves to its Checking Domain, the Spec[ifier] of TP, as shown in (4b).

(4) a.


TP
T'
T
VP
DP
V'
John
V
DP
sees
D'
D
NP
the
N'
N
cat

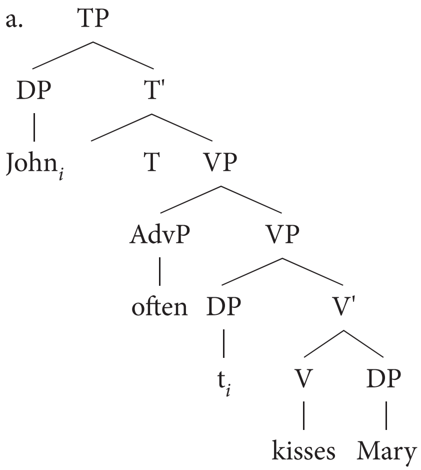
(4) b.


TP
Spec
T'
John$_i$
T
VP
DP
V'
t$_i$
V
DP
sees
D'
D
NP
the
N'
N
cat

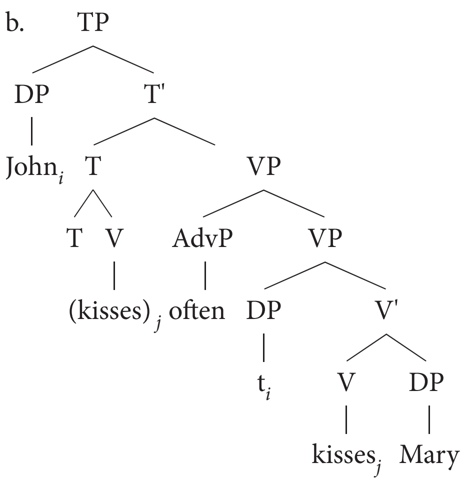
There are some terminological departures from earlier generative models. TP, or Tense Phrase, replaces IP, Infinitival Phrase; DP, or Determiner Phrase, is headed by a determiner and dominates NP, as illustrated. The subject originates in a VP-internal position, raising to the Spec of T to check its case feature. *t* is the trace of movement, co-indexed by *i*, as in classical approaches.

Now consider an example of head movement, illustrated in (5). The successive application of Merge results in the formation of a base structure; as in (4), the subject DP moves out of the VP shell to check its case feature. The resulting structure is shown in (5a). V, a head, moves to T by head adjunction in order to value and delete its φ-features, as shown in (5b).

(5) a.



b.



Feature strength (*weak*, *strong*) is the primary mechanism in the Minimalist Program used to account for crosslinguistic variations in word order. Notice, for instance, the contrast in (6).

(6) a. John often kisses Mary
  b. John completely lost his mind
  c. Jean embrasse souvent Marie
  d. Jean perdit complètement la tête

In English, VP-adverbs precede verbs, but in French they follow them. We might assume, then, that in English V moves to T *covertly*, attracted by T's *weak* φ-features; this is represented in (5b) with the use of parentheses around the verb, illustrating that the phonetic features of the V have been left behind. By contrast, in French, T has *strong* φ-features, resulting in *overt* movement. In this case, all of V's features raise, with the result that it occurs before its adverbial modifier in (6).

Feature strength can similarly be used to account for word order differences in the case of XP movement. For instance, if the case feature of T is *strong*, then the subject DP must move *overtly* out of its VP shell, bringing along its phonetic content. Overt movement of the subject DP results in preverbal subject word order (SV order, as in English, French or Spanish). However, if the case feature is *weak*, then the subject DP will move *covertly*, resulting in postverbal word order (VS order, as in Irish, Breton or Zapotec). We return to basic word order differences in our discussion of the data below, extending an analysis of CS data from SV/VS languages to account for the adjectival data.

The codeswitching theory

In the Minimalist Program, all parameters are encoded in the lexicon, with the consequence that linguistic variation falls out from the morphological properties of the lexical items. If all syntactic variation is associated with the lexicon, as in the Minimalist Program, then CS may be seen as the simple consequence of mixing items from multiple lexicons in the course of a derivation. (We return to the question of whether lexicons are separate for bilinguals in our discussion of possible future psycholinguistic research below.) MacSwan (1999, 2000) develops a model of CS in which items may be drawn from the lexicon of multiple (discretely represented) languages to introduce features into the Lexical Array, which must then be checked for convergence in the same way as monolingual features must be checked, with no CS-specific mechanisms permitted. The grammatical requirements are simply carried along with the lexical items of the respective systems. On this view, the relevant theory of CS is stated as in (7):

(7) Nothing constrains CS apart from the requirements of the mixed grammars (MacSwan, 1999).

Note that (7) is a theory of CS, and not part of the theory of grammar itself. Indeed, (7) implies that no rule or principle of grammar may make explicit reference to CS, nor to the identities of particular languages.

Although an extensive review of the CS literature is beyond the scope of this chapter, we note that the approach pursued here contrasts with other popular theories of CS in that it does not permit the formation of CS-specific rules or principles. To illustrate the point more clearly, we briefly consider one example of a constraint-oriented theory of CS, namely, the Matrix Language Frame (MLF) Model of Myers-Scotton (1993). Although similar proposals appeared earlier (de Bot, 1992; Azuma, 1991, 1993), Myers-Scotton's (1993) MLF Model has had a strong influence on the field of CS, particularly among psychologically-trained psycholinguists.

The MLF Model differentiates the languages involved in CS, as other models (e.g., Joshi, 1985) have also done; one language is known as the *matrix language* (ML), the other as the *embedded language* (EL). According to this approach, the matrix language defines the surface structure positions for content words and functional elements. The MLF Model includes two basic components – the Morpheme Order Principle, which requires that morphemes within a bilingual constituent follow the order prescribed by the ML, and the System Morpheme Principle, which states that all "system morphemes" – defined as morphemes which have grammatical relations with other constituents outside their maximal projections – come from the ML in any CS utterance. Note that the principles are formulated as specific *constraints* on CS: The grammatical principles responsible for defining the distribution of CS explicitly refer to the separate languages involves in CS, with no formal definition of the languages involved.

Criticisms of the MLF Model appear in Muysken and de Rooij (1995), Bentahila (1995), Muysken (2000), and MacSwan (2005). Myers-Scotton's (1993) had originally defined the ML as the language contributing the majority of the morphemes in an utterance, which "may change across time, and even within a conversation" (p. 69), introducing a problem of falsifiability: Since the language defining the structural requirements could invisibly change at any time, one never knew what structural requirements were in force. However, in later work a more structurally-oriented definition of the ML was offered: "The ML may change within successive CPs, even within a multi-clausal sentence, but we stress that the ML does not change within a single bilingual CP" (Jake, Myers-Scotton & Gross, 2002, p. 73). The structural definition makes a more specific prediction: Within single CP (or sentence), all grammatical morphemes will be from one language only (System

Morpheme Principle), and the language contributing the grammatical morphemes will also define the surface order of the utterance (Morpheme Order Principle).

Myers-Scotton and colleagues additionally stipulate that an "EL island" may occur below the CP: "[A]s well-formed maximal constituents in the EL, [EL islands] are not inflected with ML system morphemes, although they occur in positions projected by the ML, following the Morpheme Order Principle" (Jake, Myers-Scotton & Gross, 2002, p. 77). That is, EL islands are essentially lawful violations of the System Morpheme Principle because they contain grammatical morphemes that are not in the ML, but an EL island must be a maximal projection and must remain true to the Morpheme Order Principle (that is, its position within the utterance must be dictated by the ML). Let us briefly review some empirical evidence bearing on these predictions, focusing on the System Morpheme Principle. The French-Italian data in (8) are reported in di Sciullo, Muysken and Singh (1986).

(8) a. No, *parce que* hanno *donné des courcours*
no, because have given of the lectures
'No, because they have given the lectures'

b. Oui, alors j'ai dit que *si potev* aller comme ça
yes so I have said that REF could walk like that
'Yes, so I said that we could go like that.'

Note that in both cases we observe a switch between an auxiliary or modal and its complement. Because these forms have grammatical relations with other lexical heads within the structure, they meet the MLF Model's definition of a system morpheme. Yet, contrary to the requirements of the System Morpheme Principle, each utterance involves system morphemes from different languages below the CP.

To rescue the MLF Model, one might argue that [*donné des cours*] in (8a) is an EL island, projected as a VP complement of the auxiliary verb, and that (8b) similarly involves an EL island [*aller comme ça*], an IP complement of the modal. However, note that the examples in (8) contrast with Spanish-English data in (9), in which a switch between an auxiliary and a participle is ill-formed. The construction in (9b) is eligible for the same structural analysis as (8a), in which an EL island is hypothesized, yet it is ill-formed, contrary to the predictions of the MLF Model.

(9) a. The students *habían visto la película italiana*
The students had seen the Italian movie

b. *The student had *visto la película italiana*
The student had seen the Italian movie

As an additional example, consider the Spanish-Nahuatl examples in (10). Notice that Spanish negation (*no*) does not tolerate a Nahuatl complement, while Nahuatl negation (*amo*) permits a Spanish complement. Both the agreement morphology on the verbs and negation count as system morphemes since they enter into grammatical relations with other morphemes (in the less obvious case of negation, it c-commands a negative polarity item and may form a syntactic clitic with its verb). Hence, according to the System Morpheme Hypothesis, both (10a) and (10b) should be ill-formed because system morphemes are mixed below the CP, yet this is not so. Remarkably, the constructions contrast in acceptability, even though they appear to have identical underlying structures. (We return to an analysis of (10) in our presentation of the Minimalist Approach to CS below.)

(10) a. *No *nitekititoc*
no ni-tekiti-toc
not 1S-work-DUR
'I'm not working'

b. Amo *estoy trabajando*
amo estoy trabaja-ndo
not be/3Ss work-DUR
'I'm not working'

Myers-Scotton and colleagues might argue that NegP is an EL Island in (10a) but not in (10b), but with no independent evidence of the status of island entities these claims appear to be mere rationalizations. Myers-Scotton (1993) and Jake, Myers-Scotton and Gross (2002) furthermore allow "internal EL islands," defined as "a constituent in the EL made up of EL morphemes following EL morpheme order, but smaller than a maximal projection" (Jake, Myers-Scotton & Gross, 2002, p. 76). In other words, not only can maximal projections be "islands," but structural units smaller than EL islands can too – sanctioning essentially any and all CS examples. One must recall that the constraint mechanism proposed as part of a model of CS cannot be selectively applied; that is, we cannot reasonably claim that negation is an island, immune from the System Morpheme Principle in (10b) but not in (10a) where the result is ill-formed. Rather, once created, these mechanisms must operate in all cases, and as such they create a universe of expectations where essentially all CS is well-formed.

Of course, all CS is not well-formed, as is abundantly clear. But there is a historical tendency for CS researchers to rely primarily on naturalistic data alone – evidence of what does occur in CS – making it impossible to discover a model that over-identifies well-formed constructions. In the absence of negative evidence, generally available through grammaticality judgment tasks, one will not be in a position to construct a generative theory of CS with the capability of generating all and only the well-formed cases. (For further discussion in the specific context of the MLF Model, see MacSwan, 2005.)

Apart from these empirical problems, there are theoretical problems associated not only with the MLF Model but also with all approaches to CS which posit CS-specific constraints. The MLF Model posits two principles, both regarded as part of the grammatical system itself, and these make explicit reference to *the languages in interaction, and, implicitly, to CS itself*. However, *languages* are each a class of expressions defined by a grammar. So a grammar *G* defines a class of expressions *L*. We cannot insert *L* as part of any function of *G*, as *L* is itself defined by *G*. Hence, explicit constraints on CS are not theoretically well defined because they reference language switching, and grammars are formally blind to the languages they generate.

Furthermore, constraints on CS may serve to provide good linguistic description (if they are empirically correct), but they do not serve to explain or enlighten. While *linguistic description* is an important first step, it does not constitute a *linguistic theory*. Hence, the more serious problem with CS-specific constraints is that they threaten to trivialize the enterprise we are undertaking: Rather than explaining descriptive restrictions observed in CS data, CS-specific mechanisms simply note these restrictions within the grammar itself so that no explanation is needed, and one is left still wondering what general principles of grammar might underlie the observations and descriptions.

Historically, CS researchers have offered up CS-specific constraints despite a clear and persistent intuition that a better theory of CS should manage without them. For example, Pfaff (1979) was among the first to consider the question of whether some mechanism external to either grammar is needed in our account of the facts of CS, concluding that no such device should be required: "It is unnecessary to posit a third grammar to account for the utterances in which the languages are mixed." About the same time Sankoff v and Poplack (1981) wrote,

> What is more consistent with the data is simply to allow the possibility that in the uttering of a sentence, the rules used to construct its constituents may be drawn at times from one monolingual grammar and at times from another.

Echoing Pfaff, Woolford (1983) similarly wrote, "There is no need to propose any sort of third, separate code-switching grammar" (p. 522). Commenting on Spanish-English CS in particular, but on theoretical approaches to CS more generally, Lipski (1985) observed,

> Strict application of Occam's Razor requires that gratuitous meta-structures be avoided whenever possible, and that bilingual language behavior be described as much as possible in terms of already existing monolingual grammars. As a result, preference must initially be given to modifications of existing grammars of

> Spanish and English, rather than to the formulation of a special bilingual generative mechanism, unless experimental evidence inexorably militates in favor of the latter alternative (pp. 83–84).

Similar strong preference for a constraint-free approach continued into the 1980s and 1990s, as di Sciullo, Muysken and Singh's (1986) influential work on the Government Constraint supposed that CS "can be seen as a rather ordinary case of language use, requiring no specific stipulation" (p. 7). Clyne (1987), working from a different perspective, similarly conjectured that CS is "governed by the kinds of structural constraints applying to monolingual performance." Belazi, Rubin and Toribio (1994) proposed their Functional Head Constraint within the context of a view of CS as "constrained solely by Universal Grammar." Mahootian (1993), also echoing Pfaff (1979) and Woolford (1983), argued against the "third grammar" approach, claiming in Santorini and Mahootian (1995) that "… codeswitching sequences are governed by exactly the same principles of phrase structure as monolingual sequences."

Thus, the importance of constructing a theory of CS which does not appeal to CS-specific mechanisms has been emphasized throughout the modern history of the field. However, in essential respects, the theoretical contexts in which many influential theories were formulated did not provide the tools needed to permit the implementation of a constraint-free theory of CS. An approach to syntax which built structure from the top down, as in the *Aspects* and later GB models, postponed lexical insertion until well after the word order had been laid out, posing a significant problem: The structure could not be sensitive to which language contributed a specific lexical item until the end, when lexical insertion occurred, but the language contributing the lexical item appeared to have strong consequences for the syntactic structure at the onset.

Within the Minimalist Program, structures are built from a stock of lexical items, essentially beginning with lexical insertion (formalized as *Select*). This important development permits CS researchers to probe the structural consequences of particular lexical items from specific languages, with no need to keep track of which languages may contribute which specific lexical elements during a final stage of lexical insertion.

The ban on word-internal codeswitching

A minor aspect of our account of the adjective facts below will depend on the observation that CS is prohibited word-internally and in head movement contexts, as has been demonstrated in a wide variety of data (see MacSwan, 2005, for review). We briefly review the theoretical account of this prohibition here.

In order to remain true to our research goal of positing no CS-specific constraints, following from (7), the ban on CS in word-internal and head movement contexts may not be declaratively stated as a constraint on syntax, but must be derived from independent principles. Furthermore, note the distinction here between *word-internal CS* and *(nonce) borrowing*: The latter involves the adaptation of a stem from one language by the phonological and morphological system of another (as in U.S. Spanish *lonchar*, 'to (have) lunch'), while the former would involve the creation of a single lexical item in which phonological coding shifts suddenly at segmental or morphological boundaries word-internally. While there are abundant examples of borrowed items, the evidence supporting word-internal CS appears to suggest that expressions of this form are not permitted.

A common assumption in CS research is that the *linguistic identity* of a word (as "Spanish" or "English" or "Arabic") is established by its morphological and phonological characteristics (Lipski, 1978; Pfaff, 1979; Woolford, 1983; Di Scuillo, Muysken & Singh, 1986; Mahootian, 1993; MacSwan, 1999). For instance, the word *lonchar* may derive from English *lunch*, but *lonchar* is regarded as a "Spanish word" because it has phonological and morphological properties which are generally compatible with the grammar of the community of speakers known as "Spanish speakers." In an important respect, CS research is concerned with interface conditions on morphophonology and syntax across discretely represented linguistic systems (MacSwan, 1999, 2005, In press).

Minimalism assumes that processes of word formation apply before an item is introduced into the Lexical Array where syntactic operations begin (Chomsky, 1995, p. 20). Furthermore, Chomsky (1995, 1998) stresses that the phonological system has a dramatically different character from the syntactic system. Specifically – with π indicating the PF representation, π the LF representation, and N the initial collection of lexical items – Chomsky posits that

> ... at the point of Spell-Out, the computation splits into two parts, one forming π and the other forming λ. The simplest assumptions are (1) that there is no further interaction between computations and (2) that computational procedures are uniform throughout: any operation can apply at any point. We adopt (1), and assume (2) for the computation from N to λ, though not for the computation from N to π; the latter modifies structures (including the internal structure of lexical entries) by processes very different from those that take place in the N $\rightarrow$ λ computation (Chomsky, 1995, p. 229).

We assume, then, that affixation interacts with phonology (at least) prelexically (before items are selected into the Lexical Array), and that phonology is sensitive to word boundaries or discrete syntactic heads.

What properties of the grammar might explain the prohibition against switching head-internally? Current approaches in phonology posit that lexical form (input) is mapped to the surface form (output) in one step, with no intermediate representations, and hypothesize that phonological constraints are prioritized with respect to each other on a language-specific basis. Each set of internally ranked constraints is a constraint dominance hierarchy, and a language-particular phonology is a set of constraint dominance hierarchies. (See McCarthy, 2002.) Since language-particular phonologies differ with respect to their internal rankings, we might reasonably posit that bilinguals have a separately encapsulated phonological system for each language in their repertoire in order to avoid *ranking paradoxes* resulting from the availability of distinct constraint dominance hierarchies with conflicting priorities.

This property of the bilingual language faculty emerges as a result of the *design constraints* imposed by the phonological system; without it, bilingualism would not be possible. It further leads us to anticipate that phonological systems may be switched between syntactic heads but not within them, since every syntactic head must be phonologically parsed at Spell Out, and the mapping of phonological structure occurs in a single step, with no intermediate representations and therefore no opportunities for switching from one phonological system to another. We state the condition as in (11) as the PF Interface Condition, introduced in MacSwan (2009).

(11) *PF Interface Condition*
  i. Phonological input is mapped to the output in one step with no intermediate representations.
  ii. Each set of internally ranked constraints is a constraint dominance hierarchy, and a language-particular phonology is a set of constraint dominance hierarchies.
  iii. Bilinguals have a separately encapsulated phonological system for each language in their repertoire in order to avoid *ranking paradoxes,* which result from the availability of distinct constraint dominance hierarchies with conflicting priorities.
  iv. Every syntactic head must be phonologically parsed at Spell Out.
  v. Therefore, the boundary between heads (words) represents the minimal opportunity for CS.

Note that the formalization in (11) is intended as a refinement of MacSwan's (1999) PF Disjunction Theorem, which had been based on segmental phonology.

The stipulation that syntactic heads are subject to phonological parsing refers to both simple and complex heads, forcing the conclusion that CS in head movement contexts is banned. We might alternatively posit that head movement is itself a phonological operation, as suggested by Chomsky (2001), and that it first builds a complex sequence of phonological features deriving from both adjoined heads, then attempts to subject them to phonological processing as a single word-like unit.

The observation that CS in banned in head movement contexts is sustained empirically. Consider, for instance, the Spanish-Nahuatl negation data previously discussed as a counter-example to the MLF Framework of Myers-Scotton (1993), repeated here.

(10) a. *No *nitekititoc*
no ni-tekiti-toc
not 1S-work-DUR
'I'm not working'

b. Amo *estoy trabajando*
amo estoy trabaja-ndo
not be/3Ss work-DUR
'I'm not working'

Although Spanish and Nahuatl have the same basic word order requirements with respect to negation, and the same basic functional and semantic properties are common to both examples, Spanish negation does not permit a Nahautl verb in its complement position in (10a), but Nahuatl negation followed by a Spanish verb is well formed in (10b). The question of interest for (10) becomes, what lexically encoded properties distinguishing Nahautl and Spanish negation can reasonably be identified as the cause of the ill-formedness in one case but not in the other?

Zagona (1988) argues that Spanish *no* is a syntactic clitic and forms part of the Spanish verbal complex as a result of head movement. To make a case for this analysis, Zagona points out that Spanish *no* must be fronted with the verb in (12), unlike the adverbs in (13).

(12) ¿Qué no dijo Juan?
what not say/1Ss/PAST Juan
'What didn't Juan say?'

(13) a. *¿Qué sólo leyó Juan?
what only read/1Ss/PAST Juan
'What did Juan only read?'

b. *¿Qué meramente leyó Juan?
what merely read/1Ss/PAST Juan
'What did Juan merely read?'

Zagona (1988) also points out that Spanish *no* cannot be contrastively stressed in (14a) as its English counterpart in (14b) can be, owing to the fact that clitics are inherently unstressable. The example in (14b) shows that in English, in contrast to Spanish, the negative element is not a syntactic clitic.

(14) a. *Juan no ha *no* hecho la tarea
Juan not has not done the task
'Juan hasn't not done the task'

b. Juan hasn't *not* done the task
These facts suggest that in Spanish, the verb is a host for negation.

Nahuatl, on the other hand, behaves differently from French and Spanish with regard to negation. A test similar to the one Zagona uses in (14) shows that Nahuatl patterns with English:

(15) Amo nio *amo* niktati nowelti
amo ni-o amo ni-k-tati no-welti
not 1S-go amo 1S-3Os-see my-sister
'I'm not going to not see my sister'

Since clitics are inherently unstressable, we may conclude from (15) that *amo* is not a clitic in Nahuatl.

We may therefore account for the contrast in (10) in terms of the ban on head movement, derived from (11). Spanish *no*, being a clitic, adjoins to the verb by head movement, while Nahuatl *amo*, absent this property, remains in situ.

We provide a brief overview of Italian and German adjectives as a preface to our discussion of the data, situating them in the context of broader issues in current syntactic theory.

Adjectives in Italian and German

In both Italian and German, articles and adjectives are free morphemes. Articles always appear in pre-nominal position in both Italian and German, as in *la casa / das Haus* ('the house'); German attributive adjectives are also prenominal, as in *das alte Haus* ('the old house'), *das grüne Haus* ('the green house'). In Italian, attributive adjectives can be either pre- or post-nominal, as in *la vecchia casa* ('the old house'), *la casa verde* ('the house green'), depending on the class to which they belong (Greenberg, 1966). For example, color and nationality adjectives occur post-nominally in Italian, while adjectives of size (*grande,* 'big'; *piccolo,* 'small') are always pre-nominal. However, it is generally agreed that the unmarked position for adjectives in Italian is the post-nominal one, even though some adjectives with high frequency appear in pre-nominal position (Cordin, 1988). In Italian, articles as well as attributive and predicative adjectives agree in gender and number with the nouns they modify. In German, only articles and attributive adjectives show agreement in gender, number and case with the noun, whereas predicative adjectives show no agreement morphology at all. (See Mallen, 1996, for further discussion.)

An interesting difference between German and Italian DPs is that in German the article is omitted with the possessive adjective, as in *mein Haus* ('my house'), whereas in Italian both the article and the possessive must be realized and must precede the noun, as in *la mia casa* ('the my house'). According to Giorgi and Longobardi (1991), this difference follows from the fact that the possessive is an adjective in some languages (such as Italian), and thus is in a specifier position, whereas in other languages (such as German) it is a determiner, and hence a head (also see Giusti, 2002). Nevertheless, in both German and Italian the unmarked position for the possessive is pre-nominal.

Consistent with general work in the Minimalist Program (Chomsky, 1995; Kayne, 1995), Cinque (1999, 2005) has proposed that a Universal Base underlies adjectives, with the order adjective > noun. On this view, differences in word order between Romance and Germanic languages follow from overt movement of the noun to a position above the adjective, resulting in the surface word order noun > adjective. As in any active domain of research, areas of controversy and disagreement persist (Abney, 1986; Bernstein, 1991, 2001; Picallo, 1991; Crisma 1993, 1996); however, we shall adopt the basic framework of Cinque (2005) in our analysis below.

Study design and findings

We present two sources of data – the first, a survey of grammaticality judgments on Italian-German CS utterances from adult bilinguals; the second, a collection of naturalistic data from younger children.

We note that a persistent controversy in the CS literature concerns whether experimental data (sentence judgments, in particular) or naturally-occurring data are more appropriate sources of evidence for constructing theories. While some researchers have strongly rejected all experimental evidence (e.g., Mahootian and Santorini, 1996), others have voiced a strong preference for it (e.g., Toribio, 2001). Naturalistic data collection has the important advantage of placing CS in a more realistic context, but it has a great disadvantage as well: It does not provide instances of starred or ill-formed sentences – or if it does, they are not labeled as such. This is a significant problem if one is interested in constructing an explicit theory of a bilingual's linguistic competence, because such a theory must generate all of the well-formed utterances in a bilingual's repertoire and none of the ill-formed ones. Without disconfirming evidence, we would have no way of knowing when a theory sanctions unacceptable utterances. We cannot confidently assume that the absence of a form in naturalistic data means that the structure is not permitted; it may be absent because it *cannot* occur, or it may be absent because it *has not yet* occurred. On the other hand, experimental data may be corrupted by language attitudes or a lack of real-world context. Thus, a balanced perspective is preferred – one which advocates careful consideration of all linguistic data, along with the inherent messiness and unique limitations associated with both approaches. We have therefore chosen to use both experimental data (collected by means of a survey) as well as naturalistic data from Cantone (2007).

The survey

The survey consisted of written mixed Italian-German utterances involving determiners, adjectives, and nouns. The grammaticality of the monolingual versions of the utterances was confirmed by native Italian and German consultants. Participants were asked to render grammaticality judgments for the mixed utterances by indicating whether each was well-formed or not. Furthermore, participants were asked to regard the utterances as written versions of spoken language, not as examples of written discourse, and to give judgments based on their intuitions about their spontaneous use of Italian and German on a daily basis. For practical reasons, it was not possible to collect these data in face-to-face interviews.

The survey was administered to 10 participants, six females and four males ranging in age from 29 to 60 years old with a median age of 28. All participants had an educational experience involving substantial time in both Germany and Italy, used both languages activity at the time the survey was conducted, and reported an onset of bilingual language exposure ranging from birth to age 3. At the time of the survey, six participants were living in Italy, four in Germany.

Table 1 shows the results of the acceptability judgment survey. German lexical items are given in *italics*.

Four items were judged as well-formed by all consultants. Two of them, *un bel garten (*'a nice garden') (Table 1, 17) and *eine alte zia* ('an old aunt') (Table 1, 18), require the same word order in both languages, namely D(eterminer) A(djective) N(oun), hence the results confirm that the participants did not consider mixed utterances as ill-formed categorically, otherwise they would had negatively judged even these two examples with correct word order in both languages. The other two sentences which were judged to be well-formed by all speakers, *una glückliche Frau* ('a happy woman') (Table 1, 1) and *una vorhersehbare Situation* ('a foreseeable situation') (Table 1, 6), involve an Italian determiner and a German adjective and noun. In these examples, word order is German, permitting us to rule out the possibility that the language of the determiner determines word order in these contexts.

Table 1. Items and results

Item	**Gloss**	**N**	**Judged Acceptable**	**Percentage acceptable**
(1) Una *glückliche Frau*	A happy woman	10	10	100%
(2) *Ein ernster* uomo	A serious man	10	6	60%
(3) Una *Kusine* tedesca	A cousin German	10	7	70%
(4) Un americano *Cousin*	An american cousin	10	2	20%
(5) *Eine* situazione pericolosa	A situation dangerous	9	7	78%
(6) Una *vorhersebare Situation*	A foreseeable situation	10	10	100%
(7) Laura *hat* i verdi *Augen*	Laura has the green eyes	10	0	0%
(8) Luca *hat die rote* capelli	Luca has the red hair	10	1	10%
(9) Laura ha *die* capelli *schwarze*	Laura has the hair black	10	2	20%
(10) Luca ha *Augen* marroni	Luca has eyes brown	9	5	56%
(11) *Weisse* cioccolata	White chocolate	10	8	80%
(12) Il *Kaffee* freddo	The coffee cold	9	7	78%
(13) Il *mein* biscotto	The my cookie	10	2	20%
(14) Mio *Fahrrad*	My bike	10	7	70%
(15) Le mie *Nudeln*	The my noodles	10	6	60%
(16) *Mein* vino	My wine	10	9	90%
(17) Un bel *Garten*	A nice garden	10	10	100%
(18) *Eine alte* zia	An old aunt	10	10	100%
(19) Una *Gegend* fredda	A region cold	10	8	80%
(20) Un *Bett* nuovo	A bed new	10	8	80%
(21) *Die französische* cucina	The french cousine	10	8	80%
(22) Le impossibili *Uhrzeiten*	The impossible times	10	5	50%

Most participants also judged *mein vino* ('my wine') (Table 1, 16) as well-formed (90%), where a German possessive determiner appears before an Italian noun. Interestingly, *mio Fahrrad* ('my bike') (Table 1, 14) and *le mie Nudeln* ('my noodles') (Table 1, 15), which also involve CS between the possessive and the noun, were judged to be well-formed less consistently (at 70% and 60% respectively). The item *il mein biscotto* ('the my cookie') (Table 1, 13) was only judged to be correct by 20% of the participants. As mentioned earlier, the Italian and German possessive differ in terms of their categorical status: Whereas the item is an adjective in Italian, it has the status of a determiner in German. We therefore expect the article to be omitted when the possessive is German and the noun is Italian, as in (16) of Table 1, but we expect that it may be retained when the possessive is Italian, as in (14) of Table 1. By contrast, the realization of the article should only occur when the possessive is Italian (Table 1, 15), but not when it is German (Table 1, 13).

These expectations appear to be consistent with the grammaticality judgments. Items (19) of Table 1, *eine Gegend fredda* ('a region cold'), and (20) of Table 1, *un Bett nuovo* ('a bed new'), were judged to be well-formed by 80% of our participants. In both cases, the German noun is preceded by an Italian article and followed by an Italian adjective. The word order D(eterminer) N(oun) A(djective) reflects the Italian monolingual counterparts, *una regione fredda/un letto nuovo*, and thus might depend on either the determiner or the adjective. The language of the noun therefore does not determine word order. As previously mentioned, the results for (Table 1, 1) and (Table 1, 6) lead us to conclude that the language of the determiner does not govern word order in CS.

Hence, the adjective is the only remaining potentially responsible element in our data. In (21) of Table 1, the Italian noun *cucina* ('kitchen') occurs after the German adjective *französische* ('French'), a construction which is ill-formed in Italian but well-formed for German. Here again, word order appears to be determined by the adjective. This can further be seen in (12) of Table 1, *il Kaffee freddo* ('the coffee cold'), and (5), *eine situazione pericolosa* ('a situation dangerous'), both items accepted by 78% of participants: The post-nominal Italian adjective determines DNA word order, independently of the noun being German (as in (12), Table 1), or Italian (as in (5), Table 1), or of the article being German (as in (5), Table 1) or Italian (as in (12), Table 1).

Although results were mixed for *ein ernster uomo* ('a serious man') (Table 1, 2) and *una Kusine tedesca* ('a cousin German') (Table 1, 3) (with 60% and 70% acceptance, respectively), both cases reveal a pattern in which word order is dictated by the language of the adjective, which is German in (2) and Italian in (3), the latter being comparable to (12). In *le impossibili Uhrzeiten* ('the impossible times') in (22), the adjective is pre-nominal according to German, the language of the noun, but not to Italian, the language of the determiner and of the adjective. Note that consultants appear to randomly find (Table 1, 22) to be well-formed (50%). In sentence (Table 1, 4), the Italian nationality adjective *americano* ('American'), occurs in pre-nominal position, a pattern which is not permitted in Italian. The example in (Table 1, 4) follows the requirements of adjective position in German but violates the requirements for an Italian adjective. Thus, only two consultants accepted this mix.

Finally, let us look at the sentences (7), (8), (9), and (10) of Table 1. In (10), *Luca ha Augen marroni* ('Luca has eyes brown'), the article is omitted, according to the requirements of the German noun (being a mass noun). However, the Italian adjective is post-nominal, which is disallowed in German. It therefore seems that the adjective position occurs according to the Italian language. However, this item has an acceptance rate of only 56%. In sentence (9), *Laura ha die capelli schwarze* ('Laura has the hair black'), the article is realized, according to the Italian noun, but with a German article. The German adjective is post-nominal, according to the Italian noun, but against German word order. As expected, (9) had very low acceptance, at 20%. The mix in (8), *Luca* <u>*hat die rote*</u> *capelli* ('Luca has the red hair'), has even lower acceptance, at 10%, although the adjective position is pre-nominal, as required in German. The negative judgement might follow from the article realization, which is ill-formed in German when using a mass noun. Example (7), *Laura* <u>*hat*</u> *i verdi* <u>*Augen*</u> ('Laura has the green eyes'), was rejected by all participants. Not only does the position of the Italian adjective not reflect the rules of Italian, but the realization of the article is discordant with both the German verb and the German noun.

In sum, we note that whenever word order of the mixed utterance reflects the language of the adjective, the sentences are predominantly judged to be acceptable. Conversely, when the word order and language of the adjective do not correspond, the sentences tend to be judged as ill-formed. The only exception seems to be (Table 1, 8); however, this item may be regarded as ill-formed by most speakers because the article is realized, contrary to the requirements of the German adjective.

Let us now briefly turn to some additional evidence from spontaneous data.

The naturalistic data

In order to get more evidence for the interplay between articles, nouns and adjectives in CS, we looked at spontaneous data from bilingual Italian/German children in Cantone (2007). Children in the sample ranged in age from 2;6,26 to 4;10,6 (years; months, days) and included three boys and two girls. The children were recorded in two separated language contexts (Italian and German) while interacting with monolingual interviewers. These methods are widely used in studies of child language development. The children were all born in Hamburg, Germany, and were all bilingual from birth, each of them having an Italian mother and a German father (for more information on data collecting procedures, see Cantone, 2007).

In 23 instances of adjective/noun CS, an Italian adjective was used in eight cases (35%). In five of these instances, word order requirements were the same in both languages, as in *un grosso nest* ('a big nest,' Jan, 4;4,27), as Italian adjectives of size precede nouns. The remaining three cases show the word order DNA, according to the language of either the article or the adjective, as in *la schaufel magica* ('the shovel magic,' Lukas, 3;1,30). In 13 of the 15 cases of German adjectives, the adjective is pre-nominal, with word order DAN. However, in all cases the noun is German, too, requiring a pre-nominal adjective, and in some cases the article is Italian, as in *un gefährliches tier* ('a dangerous animal,' Lukas, 3;8,3). These facts similarly suggest that the determiner is not responsible for word order in these constructions. Interestingly, in two utterances, a German adjective occurs in post-nominal position, with DNA word order, while the article and the noun are Italian, as in *una cosa schwer* ('a thing heavy,' Aurelio, 4;0,9) and *ein pannolino klein* ('a diaper small,' Carlotta, 2;9,25). These two utterances are the only ones which do not corroborate the hypothesis that the adjective is responsible for word order in mixed utterances.

Once again, while the data remain slightly ambiguous, a relatively clear pattern has emerged in both the survey data and the naturalistic data converge on the finding that the word order requirements of the language of the adjective determines the word order in DP-internal contexts involving CS. This finding is also consistent with the predominant conclusion of previous research, reviewed earlier. Below we turn to an analysis of this descriptive generalization in terms of the theoretical framework discussed above.

Analysis

A striking result of the Minimalist program is the account of differences in basic word order in terms of movement requirements associated with feature strength. MacSwan (2004) proposed an analysis of word order facts obtained in CS between languages differing with regard to whether subjects occurred pre-verbally (SV languages) or post-verbally (VS languages). Our analysis of the adjectival CS facts extends this analysis, drawing on Cinque (2005). We therefore summarize it here.

The Universal Base structure is assumed to be underlyingly SVO with a VP-internal subject, as illustrated in (4). Subjects move overtly, bringing phonological material along, in the case of SV word order; they move covertly (invisibly, leaving phonological material behind) in the case of VS languages. In (4), we illustrated overt subject raising; (4a) shows the subject, *John*, in its VP-internal position, while (4b) shows it situated in its higher position as the specifier of TP. V^0 raises to T^0 (also known as Agr^0 in some analyses) to value φ-features (a method for checking agreement features among elements within a tree).

In GB Theory, the Extended Projection Principle (EPP) stipulated that clauses must have subjects. More recently and in the context of the Minimalist Program, the EPP has come to be regarded as a feature (the EPP feature) which triggers movement of elements in subject position. In current terms, then, if the subject overtly checks its EPP feature in the specifier position of T^0, then an SVO word order results. If it checks its EPP feature covertly, the resulting word order will be VSO. Thus, the typological distinction between SVO and VSO languages is captured in terms of the strength of the EPP feature in T^0.

Recall that the formation of mixed-language heads is ruled out by the PF Interface Condition in (11). Therefore, if V^0 raises to T^0 to check φ-features, as illustrated in (5), both elements must be of the same language, otherwise the resulting complex head would be ill-formed. As a result, the language of the verb will determine the language of T^0, hence the value of its EPP feature. In this way the system developed here predicts that the language of the verb will determine the position of the subject – if the verb is from an SVO language, the subject should occur preverbally, whether it is from an SVO language or not; if the verb is from a VSO language, the subject should occur postverbally, regardless of the requirements of the language of the subject. These facts are attested in a wide range of corpora, as shown in (15) and discussed in MacSwan (2004).

(15) a. VS verb (Irish), SV subject (English) (Stenson, 1990)
Beidh *jet lag* an tógáil a phháirt ann
be-FUT taking its part in-it
'Jet lag will be playing its part in it'

b. VS verb (Irish), SV subject (English) (Stenson, 1990)
Fuair sé *thousand pounds*
get-PA he
'He got a thousand pounds'

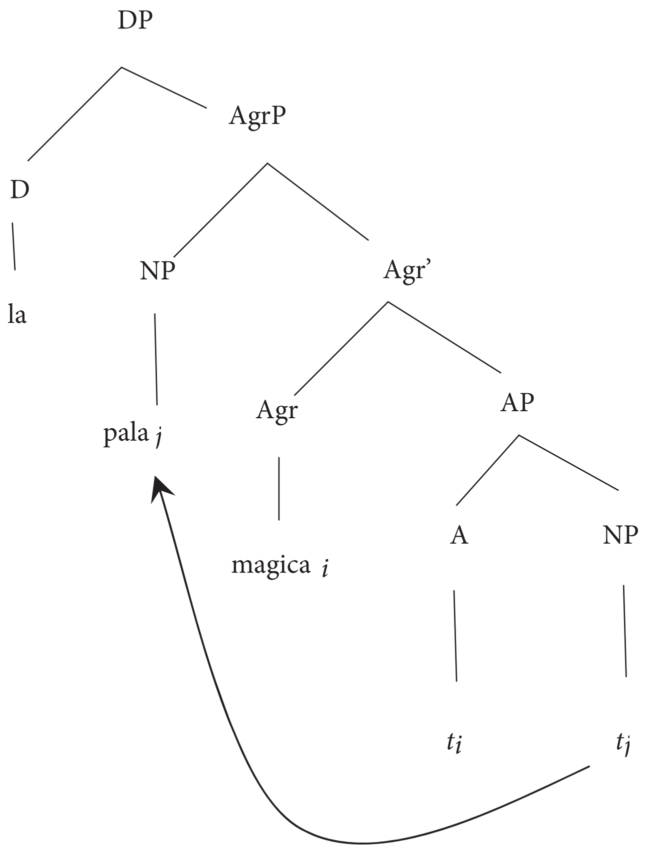
c. VS verb (Breton), SV subject (French) (Pensel, 1979)
Oa ket *des armes*
be-3S IMP NEG of-the arms
'There were no arms'

d. VS verb (Breton), SV subject (French) (Troadec, 1983)
Setu oa *l'état-major* du-se barzh ti Lanserot
There be-imp the military-staff down-there in house Lanserot
'There was the military staff down there in Lanserot's house'

e. VS verb (SLQ Zapotec), SV subject (Spanish) (MacSwan, 2004)
S-to'oh *mi esposa* el coche
DEF-sell my wife the car
'My wife will definitely sell the car'

Now consider the adjective/noun facts where a parallel analysis appears to be available. Following Cinque (2005), we posit that (16) is the base structure underlying adjectival constructions in Romance and Germanic languages. In the case of Italian *la pala magica* ('the magic shovel'), the NP raises to value features in the specifier position of Agr, deriving DAN word order. To derive DNA word order, as in German, the NP checks features covertly, leaving its phonetic features behind with its trace. Note, too, that the Adjective raises to check features with Agr by head movement, as V raised to T in our account of the VS/SV facts.

(16)



We may now account for the CS facts in a straightforward manner. We are assured that Agr is in the language of the adjective because the adjective raises to Agr by head movement, and mixed constructions in head movement contexts are disallowed by (11). Italian Agr has a strong EPP feature, forcing the NP to raise overtly to its specifier position. German Agr, by contrast, has a week EPP feature, whereby the NP has its EPP feature valued covertly and remains in situ at PF. Hence, Italian Agr forces the NP to raise overtly, while German Agr prompts the NP to raise covertly, accounting for the descriptive generalization noted early, namely, that the language of the adjective determines the position of the NP relative to the adjective.

Consider again the principle articulated in (7), namely, that there are no constraints on CS apart from those which emerge from the two grammars in interaction. Our analysis of the noun/adjective facts appeals only to independently motivated principles of grammar, and does not make reference to any constraints which specifically govern CS. In this respect it differs from the MLF Model and other constraint-oriented approaches. The analysis of the adjectival data presented here along these lines serves as yet another proof of concept supporting the utility of this approach (for others, see MacSwan, 1999, 2009; van Gelderen & MacSwan, 2008). We hope that others interested in CS, both in linguistics and psychology, will consider our proposal to dispose of all CS-specific constraints and focus attention on actual properties of grammar evident in the utterances under investigation, as the research program in (7) urges us to do.

Relevance to psycholinguistic research

While *psycholinguistics* might be viewed etymologically as a marriage between linguistics and psychology, its history reflects a stormy relationship between the two fields. In his intriguing history, Kess (1991) described the briefly lived Linguistic Period in psycholinguistics:

> This was the era after the late 1950s, and on into the 1960s, a time when linguistic theory fuelled the engines of psycholinguistic enterprise. Specifically, the form of linguistic theory was the type of linguistics founded on the theoretical pattern of generative transformational grammar, as first proposed by Noam Chomsky in 1957, elaborated in 1965, and universalized in 1968 (p. 4).

However, as Gardner (1987) noted, most psychologists in the 1960s remained highly skeptical of the relevance of Chomsky's approach to their basic pursuits. The ensuing linguistics wars, along with debates over an "independent syntax," created a fragmented intellectual climate within the field, with little or no cross-disciplinary discussion among participants in a reputedly interdisciplinary field.

Although Kess (1991) sees the Linguistic Period as giving way to a more interdisciplinary Cognitive Science period, a better interpretation may be that psycholinguistics has become and yet remains highly fragmented. To this day, linguistically-oriented and psychologically-oriented researchers in child language acquisition, one of the earliest subfields of psycholinguistics, largely publish in different journals, attend different conferences, and generally only engage one another's work in the interest of exchanging snipes.

The Ohio State University Workshop on Codeswitching provided a forum for psychologists and linguists interested in CS to learn from one another's research, and to think creatively about ways in which psycholinguistics might engage in interdisciplinary research drawing from both disciplines. From our perspective, many intriguing psycholinguistic questions may be informed and guided by research in mainstream linguistics focused on CS, such as has been illustrated in the present chapter.

De Bot (2000) defined psycholinguistics as "the field of study concerned with psychological aspects of language studies." If we take "language studies" here to refer to *linguistic research*, then psycholinguistics is distinguished from the *psychology of language* by virtue of its commitment to linguistics as a source of theoretical inspiration for empirical investigation. We briefly discuss a few areas where there may be fertile ground for interdisciplinary work related to bilingualism and CS, in which linguistic theory might usefully guide psycholinguistic investigations.

The bilingual lexicon

Research on the organization of the bilingual lexicon is a topic of great interest among psycholinguists. Cook (1992) has argued, for example, that bilinguals share a common lexicon for both their languages. However, the line of psycholinguistic research Cook reviewed tends to view lexicons as essentially mental dictionaries which store semantic and a very small amount of idiosyncratic information, but not morphological information (crucially, for Cook, affixation does not take place internally in the lexicon, as it does in the Minimalist Program). By contrast, and consistent with the conception proposed here, Kirsner's (1986) experimental results found lexical representation to be language-specific "as an artifact of morphological independence" (p. 39). Also see Costa, Miozzo and Caramazza's (1999) interesting results.

The proposal supported here (following MacSwan, 1999), that a bilingual has discretely represented mental lexicons, is motivated by considerations related to the grammatical system. Because phonological rules are sensitive to inflectional content (morphology), and because the rules of word formation appear to apply internally within the lexicon, we are faced with two alternatives: (1) There is a single lexicon, and each lexical item is marked for a specific set of phonological and morphological rules which yield the appearance of one language or another; or (2) the lexical items in a bilingual's repertoire are mentally compartmentalized in some sense, with a specific set of phonological and morphological rules associated with each "lexical compartment" (each "language"). The second alternative appears more economical, and therefore preferred. However, lexical items also seem to interact in ways determined by their meaning, and we are therefore left with abiding questions about how the conceptual and linguistic properties of lexical items are related. Psycholinguists might seek to build models of the bilingual lexicon which attempt to reconcile relevant evidence generated by both linguistic and psychological research.

Child language acquisition

In many respects, research on child language acquisition proceeds much like work on CS: Specific assumptions are made about the special nature of the language user, and linguistic data are analyzed accordingly. Müller and Cantone (2009) reviewed studies on CS among children actively acquiring a first language, noting that substantially many have been directed at the question of whether children abide by various constraints which have been proposed in the CS literature. These studies have generally found mixed results, with ample evidence that the constraints are violated. As Müller and Cantone (2009) note, the pattern of evidence is the same among adult bilinguals: There is rich evidence that the proposed constraints do not adequately define CS patterns in any context, for subjects of any age. Paradis, Nicoladis and Genesee (2000) seek to account for attested variation by positing that "the structure of code-switched utterances undergoes developmental change from the immature to the mature bilingual speaker" (p. 246).

However, another approach might be for researchers in child language to narrowly focus on specific grammatical structures in which CS is observed, rather than a continuation of assessments of controversial and now disfavored constraints. Such research might seek to reconcile observed CS patterns in young children with known developmental sequences in child language acquisition. For example, a study might focus on the well-known optional infinitive stage in child language acquisition and analyze CS in subject/verb configurations to determine whether some or another account of optional infinitives is convergent with a constraint-free analysis of CS in this context. Finite verbs, but not infinitivals, have relations with external structures in ways which impact grammaticality in CS. One wonders whether the predictions of respective theories in these domains might converge, or might rather lead to new and intriguing questions. For recent treatments of CS in young children, see Cantone (2007) and Radford and colleagues (2007).

Natural language processing and speech processing

Natural Language Processing (NLP) and Speech Processing have developed into separate fields within psycholinguistics. Stabler (1997, 2001) has developed a computational parsing algorithm based on Minimalist syntax which is powerful enough to recognize and generate natural language expressions. Stabler and MacSwan (In press) extend Stabler's system to bilingual data, and show that a simple computational parser developed on Minimalist principles efficiently recognizes and generates bilingual CS expressions with no special mechanisms (constraints) needed. Joshi (1985) similarly focused his attention on bilingual computational parsing and processing, but he did not propose a constraint-free solution.

Research on speech processing might similarly examine whether a monolingual model is adequate for bilingual speech. Jake, Myers-Scotton and Gross (2002) argued that research on speech errors, which formed the basis for Levelt's (1989) *Speaking* model underlying the MLF Model, also provides evidence that the "matrix language" (ML) is part of general linguistic competence. Although there is indeed evidence from speech error research that monolingual sentence production involves the construction of something like a "language frame," such evidence does not suffice to make the point that the MLF Model has independent justification. Garrett (1975) and numerous others, for instance, report speech errors such as "Make it so the *apple* has more *trees*," in which the grammatical morphemes associated with the speaker's intended expression ("Make it so the tree has more apples") remain in place even though the lexical content words have been inverted. We might readily assume that bilingual language production similarly involves such mechanisms. This would lead us to expect codeswitched speech errors in parallel to this, in which inflectional morphemes do not get inverted with lexical content words, as in, "Make it so the apple has *más árboles*" ('Make it so the apple has more trees'). However, note that there is no concurrent implication that a ML/EL contrast is operative in the linguistic system of bilinguals, or that all system morphemes should come from only one language in the course of sentence production, or even that only one language should be activated in generating the bilingual "language frame." Thus, research on bilingual speech processing might seek to explore whether a model of speech production and perception may account for bilingual CS data without additional CS-specific stipulations.

Bilingual language disorders

Finally, research on bilinguals with Specific Language Impairment (SLI) might examine whether CS patterns differently among bilinguals with SLI, and pursue an account of the observed data in terms of analyses consistent with the view that there are no CS-specific mechanisms. In is widely assumed, for instance, that functional categories play a crucial role in syntactic derivations, and have therefore been highlighted in research on SLI (Leonard, 1998). What are the specific properties of disordered language which might account for different CS patterns in bilinguals with SLI?

Conclusions

We have used data involving German-Italian CS in DP contexts to illustrate that CS may be analyzed using the same set of mechanisms independently motivated for the analysis of monolingual data, with no CS-specific constraints required. Our account serves as a proof of concept for a CS research program which repudiates explicit constraints on CS, showing that standard assumptions regarding the internal structure of the DP in Germanic and Romance are sufficient to explain the observed CS patterns. We further provide a brief summary of topics in the psycholinguistic literature which might benefit by engaging linguistic research on CS. We encourage others in the field to pursue similar analyses, both in linguistics and psycholinguistics, believing that such an approach will lead to new and intriguing questions in the study of bilingualism, and unearth new insights about the general architecture of bilingualism.

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CHAPTER 11

On the unity of contact phenomena and their underlying mechanisms

The case of borrowing

Donald Winford
Dept. of Linguistics, The Ohio State University.[1]

The study of language contact phenomena has become increasingly concerned with investigation of the (psycho-)linguistic processes involved in the kinds of language mixture produced by bilinguals, and by extension, in the creation of languages that are the outcomes of such mixture. However, the underlying similarities between bilingual speech production and the creation of contact languages have been explored only by a few researchers. Moreover, some scholars have even denied that there is any real similarity in the mechanisms or processes underlying the two kinds of contact phenomena. In this paper, I draw on van Coetsem's framework for contact-induced change, which distinguishes between two major transfer types – borrowing and imposition– each with its own distinctive mechanisms of change. In this paper, I focus only on the (psycho-) linguistic mechanisms underlying borrowing, and I argue that the way these operate in various kinds of contemporary code mixture is similar to the ways in which they have always operated in the creation of contact languages. I pay particular attention to unity of the mechanisms involved in classic code switching and in the creation of various types of mixed languages. Recognition of the underlying unity of the processes involved in these types of bilingual language mixture has implications for models of both the linguistic and pycholinguistic processes at work in language contact.

Keywords: Code switching, language contact, psycholinguistics, transfer, borrowing, mixed languages

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Introduction

The last few decades have witnessed a growing rapport between the study of bilingual language mixture in both the present and the past, and the investigation of the psycholinguistic processes involved in the production of bilingual speech. Contact linguists who study contemporary bilingual behavior have documented and classified various forms of cross-linguistic influence, particularly those involved in code switching. Linguists who study contact languages deal with outcomes of language mixture that crystallized in the distant past, the processes of whose creation we can no longer observe. Psycholinguistic approaches attempt to provide insight into the nature of the language production of bilingual speakers, and the cognitive processes attendant on the way they mix their languages. Yet it is clear that we are all dealing with the same questions concerning the mechanisms of contact-induced change, and that the unity of contact phenomena should somehow be captured in a unified model that incorporates insights from linguistic theory, psycholinguistics, and of course, sociolinguistics. (See also Backus, Gardner, this volume). The focus of this paper is on the unity of the types and processes of language mixture involved in both code switching and in the creation of various types of mixed languages. One of my goals is to suggest some connections between the assumptions and analyses of contact linguistics and the concepts and approaches of psycholinguistics. But this objective is far too ambitious for me to do it any justice here.

I use the term 'code switching' advisedly, since there has long been controversy over its exact definition and range of application, as can be seen throughout this volume. Gardner-Chloros (1995), for instance, challenges the "reification" of the term as referring only to a particular type of bilingual mixture, ignoring the fact that such mixture is far more varied and extensive in scope than the traditional use of the term would imply. Clyne, for his part, suggests that the term has become so polysemous and unclear that it is necessary to find more precise terms "to map out the boundaries and interfaces" (2003: 72). Though there is some truth in both these arguments, it seems wiser to accept the fact that all terminology is subject to imprecision, so our task is to reduce that as far as we can. Following the conventional wisdom, then, I take code-switching to include three types of language mixture: 'classic" or "insertional" code-switching, "alternational" or "interclausal" code switching, and the peculiar blend of insertional and alternational code-switching that Muysken (1997b) refers to as "congruent lexicalization." My main focus here will be on "classic" CS, in which mostly lexical content morphemes and/or phrasal constituents from an external language are inserted into the morphosyntactic frame of a recipient or matrix language. I do not distinguish switches of this type from borrowings, since there are no clear criteria on which such a distinction can be based (Winford 2003). I will argue for strong connections between classic CS and the creation of the category of bilingual mixed languages that Bakker (2003) refers to as "intertwined" languages. The process of lexical insertion by which such languages were created began in much the same way as classic CS, with the fundamental difference that the process eventually involved most if not all content morphemes, and the mixture became conventionalized as a new linguistic norm.

There are also other outcomes of bilingual mixture that involve combinations of structure and lexicon from at least two languages, which have also been included under the umbrella of codeswitching. Among them are cases of structural convergence such as those that Clyne (2003) documents for immigrant German, Dutch, etc., in Australia, as in the following example of immigrant German Clyne 2003:.

(1)	Wir	haben	gegangen	zu	Schule	in	Tarrington
	We	have	gone	to	school	in	Tarrington

'We went to school in Tarrington.'

Compare Standard German:

(2) Wir sind in Tarrington zur Schule gengangen.

In these cases, we find transfer of word order and other grammatical structures from English to the immigrant languages. These kinds of language mixture find strong parallels in the category of mixed languages that Bakker (2003) refers to as "converted languages," as well as in other instances of structural convergence under contact. Convergent changes of this type are quite different from the kinds of contact phenomena we find in classic code switching and intertwined languages. They do not result from borrowing as I define it here, but rather from processes of imposition, a very different mechanism of contact-induced change. In the example from Clyne, English syntactic procedures (word order) are activated along with access of German lexical items. The underlying mechanism involves the imposition of English syntax on German words – a strategy facilitated by the fact that the bilinguals in question have become English-dominant. Similar strategies are also found in cases of second language acquisition, when learners impose the syntax of their (dominant) L1 on their version of the L2 (Odlin 1990).[1] See Winford (2005) for a fuller discussion of the differences between borrowing and imposition.

1. A reviewer suggests that Clyne's examples of structural transference could just as well be perceived as instances of structural borrowing. This suggestion is not compatible with van Coetsems' view of borrowing as involving the importation of source language elements into a dominant recipient language, with relatively slight impact on the overall grammar of the latter. It

Mixed languages

Bakker defines mixed languages as having numerically (roughly) equal and identifiable components from two or more languages. They include "intertwined languages" and "converted languages." The former display a clear dichotomy of the lexicon and the grammatical system, and might be referred to as "lexicon-grammar" (L-G) mixed languages. They include well-known languages such as Media Lengua, Angloromani, Ma'a, etc. A converted language, on the other hand, is a language that "takes over the complete grammatical system of a language without borrowing lexical material or grammatical morphemes of any significance" (Bakker 2003: 110). Examples include Sri Lanka Portuguese, Sri Lanka Malay, and a variety of other mixed languages such as those that Ross (1996) describes as cases of "metatypy", and those of Northwest New Britain (Papua New Guinea) described by Thurston (1987). The available studies do not make it clear exactly why or how these two types of mixed language are to be distinguished, particularly with respect to the actual processes of change that are involved. Bakker tells us that 'intertwined languages' are the result of "intertwining", while converted languages are the result of "convergence intertwining" or "conversion." Neither of these processes is clearly defined or explained. I claim that they can in fact be distinguished in terms of both the directionality of the changes and the type of process involved. More specifically, as argued in Winford (2005), I claim that intertwined languages arise via processes of massive lexical borrowing, while converted languages arise to a large extent via processes of (structural) imposition. I further argue that the same kinds of agentivity and processes of change that are found in these types of mixed languages characterize the types of language mixture found in contemporary bilingual speech. I therefore find myself in complete disagreement with Bakker's (2003: 142) claim that "intertwined and converted languages came about through processes different from those encountered in "normal" language contact," if by that he means the linguistic processes involved. I will demonstrate below that the similarities in the kinds of language mixture found in contemporary bilingual speech (particularly insertional code-switching) and intertwined languages provides clear evidence against this view. Of course, there are important differences in the social contexts and motivations, as well as in the degrees of conventionalization involved in the two kinds of situation, but I will not consider these here.

seems more feasible to argue that Clyne's bilinguals, being English-dominant, impose English syntactic encoding processes even in their production of German,

A framework for contact-induced change

My approach to the classification and analysis of bilingual language mixture is based primarily on van Coetsem's framework for the study of contact induced change. This approach distinguishes between two types of cross-linguistic influence, or 'transfer types", namely, borrowing and imposition. Van Coetsem (1988: 3) defines borrowing as follows:

> If the recipient language speaker is the agent, as in the case of an English speaker using French words while speaking English, the transfer of material (and this naturally includes structure) from the source language to the recipient language is *borrowing (recipient language agentivity)* (italics in original).

In imposition, on the other hand, "the source language speaker is the agent, as in the case of a French speaker using his French articulatory habits while speaking English" (ibid.) 'Imposition' is largely equivalent to terms like 'interference via shift', 'L1 transfer', and 'substratum influence' that appear in the literature. Prototypical cases of borrowing involve transfer of lexical items from an external source language (or L2) into the speaker's native language (L1). Prototypical cases of imposition involve transfer, usually of structural patterns and categories, from a speaker's L1 into an L2 that he is in process of learning. But the more general principle is that borrowing takes place from a less dominant into a more dominant language, while imposition takes place from a more to a less dominant language. I discuss this further below.

Like other terms that refer to contact-induced change, borrowing and imposition can refer both to the results of change, and to the processes underlying them. My focus here is on the latter use of the terms. In both cases, there is a source language (SL) and a recipient language (RL). The direction of transfer of linguistic features is always from the source language to the RL, and the agent of transfer can be either the recipient language or the source language speaker. In the former case, we have borrowing (RL agentivity), in the latter, imposition (SL agentivity).

Also highly relevant to the nature and direction of transfer is the notion of language dominance. In borrowing, the recipient language is the dominant language of the speaker, while in imposition, the source language is the dominant language. It is crucial to note that dominance here refers to linguistic dominance, that is, the fact that the speaker is more proficient in one of the languages in contact.[2] This must be distinguished from social dominance, which refers to the

2. As reviewer Kees de Bot points out, dominance is a crucial issue indeed, may involve more than just proficiency. For instance, it can also be temporary availability due to recent use, frequency and so on. Also, dominance is not necessarily working on the whole language system, since it can differ for different sub-processes in production (see Broersma et al. this volume). I

political or social status of one of the languages. The socially dominant language may or may not be the linguistically dominant language of the speaker. Also, dominance relationships may change over time, both in the individual speaker, and in the community at large. And such shifts in dominance may result in different outcomes, or lead to attrition of the previously dominant language. This means, for instance, that imposition can also involve the transfer of structural patterns from an L2 in which the speaker has become more proficient, into an L1 that has become less dominant.

For all of these reasons, we need to distinguish the agents of change from the kinds of agentivity they employ in introducing innovations. This is so because the same agents may employ either kind of agentivity and hence different transfer types in the same contact situation. This is particularly true of skilled bilinguals, who may choose to select either language as the more activated one, or to activate one or the other at different points in the language production process. A good example of this is the CS behavior of the Japanese/English bilinguals discussed by Nishimura (1986, 1997). They produced mixed utterances whose morphosyntactic frame is either that of English, or of Japanese, or sometimes a blend of the two (see Winford 2005 for further discussion). Such cases of bilingualism pose difficult problems for both linguistic and psycholinguistic attempts to explain bilingual speech, and to identify the specific mechanisms underlying the mixture. As van Coetsem (1988: 87) notes, "the smaller the difference in language dominance relations between the languages of a bilingual, the weaker would be the demarcation between the two transfer types, and the smaller the distinction between non-nativeness (non-primary language) and nativeness (primary language)".

Differences between recipient language and source language agentivity are also related to what Van Coetsem (1988: 25) calls the 'stability gradient' of language. This refers to the fact that certain components of a language, such as phonology, morphology and syntax, tend to be more stable and hence resistant to change, while others, such as vocabulary, are less stable and thus more amenable to change. This is partly why borrowing tends to be mostly lexical, and to have little if any effect on the recipient language grammar. On the other hand, in imposition, where the source language grammar is more stable and resistant to change, grammatical features can be transferred more readily, leading to significant structural change in the speaker's version of the RL (see Marian, this volume, for a detailed discussion from the psycholinguistic perspective).

Unlike earlier approaches that viewed contact-induced change from a primarily sociolinguistic and socio-historical perspective (e.g., Thomason & Kaufman

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will not consider all the problems involved in defining or measuring language dominance here, but simply maintain that it is crucial to the distinction between borrowing and imposition.

1988), Van Coetsem's framework focuses on both the actual mechanisms of change and on the diffusion of change, which is a social phenomenon. The former have to do with the (psycho)linguistic processes of language production that reside in individual minds, while the latter has to do with processes of diffusion, leveling and focusing (conventionalization) within speech communities, which are sociolinguistically motivated. This emphasis on the cognitive processes involved in bilingual language mixture allows for new links to be made between purely structural (linguistic) approaches to contact, and psycholinguistic models of bilingual speech production. I discuss this further below.

Connections between bilingual language mixture and mixed languages

Students of language contact have long debated whether the linguistic processes that lead to the emergence of contact languages are unique to those situations, or commonplace (Thomason 1995, Matras & Bakker 2003). As Matras & Bakker (2003: 14) note, the view that mixed languages are the result of unique processes is reflected in researchers' use of notions and concepts applied only to those languages, such as 'intertwining', 'relexification', 'lexical reorientation versus selective replication', etc. Different viewpoints are also reflected in the labels scholars use to distinguish between two broad categories of language contact phenomena, as follows:

> Borrowing versus convergence (Croft 2003: 51);
> Transfer of substance linguemes, i.e., overt elements, versus schematic linguemes, i.e, abstract structural elements (ibid.);
> Direct versus indirect diffusion (Aikhenvald 2002);
> Intertwining versus convergence intertwining or conversion (Bakker 2003: 104);
> Classic code switching versus convergence (Myers-Scotton 2002).

Many such terms are used without clear definition or explanation of the processes or mechanisms of change they refer to. This reflects a general tendency in the field to focus on the outcomes of contact, rather than on the processes that produce them. This is unfortunate, since it stands in the way of a full understanding of the differences as well as the similarities between the mechanisms of change that produce different types of contact phenomena. The only point on which researchers seem to agree is that the relevant processes of mixture or change relate to the division between the lexicon and the grammar, and how these are accessed in the speech production process. This at least gives us a starting point for understanding the kinds of mixture that occur.

Following this, we can identify several kinds of bilingual language mixture. The first type may be referred to as insertional code-switching. It subsumes 'classic' code switching' and the kind of mixture that has been referred to as 'composite code switching.' Classic code switching involves the insertion of content morphemes as well as phrasal constituents (NPs, PPs,etc.) or 'islands' from one language into the morphosyntactic frame of another. In composite code-switching, structural elements from both languages make up the morphosyntactic frame. The second category of bilingual mixture subsumes two types of structural convergence, one in which surface structural elements are directly transferred from one language to another, and another in which abstract structural patterns are transferred, but not accompanied by surface elements from the source language.[3] The following diagram illustrates:

Insertional CS		Structural convergence	
Classic code-switching	Composite code-switching	Direct diffusion of surface gramm. elements	Indirect diffusion of abstract gramm. structures/categories.

In this paper, I will be concerned only with the two types of insertional code-switching and their relationship to intertwined languages. I will not discuss structural convergence, though of course there are many contact languages that arose through this general process of change, in which imposition tends to play a major role. I will show that the same processes as well as outcomes of language mixture are to be found in the insertional code switching behavior of bilinguals as well as in intertwined languages. I will further argue that borrowing under RL agentivity is the transfer type underlying these kinds of bilingual mixture, and that the same psycholinguistic processes are at work in both cases.

Code switching, mixed languages, and recipient language (RL) agentivity

One of the hotly-debated issues in the study of bilingual mixed languages concerns the role of code-switching in their formation. Many scholars explicitly reject a role for code switching in the emergence of mixed languages. Thus, Golovko's investigation of Russian/Karelian and Russian/Yakut mixtures led him to conclude that these cases of "ethnic and linguistic mélange" hardly fit any known model of code switching. Hence he argues that "the idea of 'classical' code switching as an initial start for emergence of mixed language should be rejected, as structurally, there is not very much in common between the two" (2003: 196). Similarly, Bakker (2003: 129) challenges the idea that insertional code switching was a path toward

3. Direct transfer of overt structural elements tends to be rare, though it has been documented (Heath 1978, Aikhenvald 2002). In cases of bilingualism under intense contact, structural convergence via indirect diffusion is far more common.

intertwined languages, since the quantity of embedded lexicon in bilingual mixed languages is far greater than in ordinary code switching, and no transitory stage between the initial CS behavior and the resulting mixed language has been documented. By contrast, Mous (2003: 217) argues that "code switching may very well lead to emergence of a mixed language," since "such a development is conceivable through the conventionalization of the switches." He points to similar ongoing developments in the emergence of contemporary mixed languages such as Tsotsitaal (Slabbert & Myers-Scotton 1996), Isicamtho (Childs 1997), and Sheng (Abdulaziz & Osinde 1997).

The arguments made against the role of code switching in the emergence of intertwined languages all seem to be based on a comparison of the results rather than of the underlying processes involved. My own view is similar to that of Mous, who recognizes that the differences is one of degree of insertion and of conventionalization, which are matters of social, not linguistic process. The extreme degree of lexical insertion that we find in intertwined languages (by contrast with CS) appears to be the result of conscious acts of "folk engineering" (Golovko 2003) or "change by deliberate decision, [which] is a quintessentially social factor (Thomason 2003: 35). Moreover, as Mous argues, newly emerging mixed languages such as Sheng and Tsotsitaal do provide evidence of a kind of transitory stage between code switching behavior and the crystallization of a new mixed language.

In terms of van Coetsem's framework, then, both classic or insertional codeswitching and the kinds of insertion found in intertwined languages are the result of the same linguistic process involved in borrowing as we have defined it. Though the actual results may vary, they arise from the same underlying (psycholinguistic) process of rl agentivity, which comes into play when individual speakers select and insert lexical items from an external SL (the less active language) into the RL (the more activated language), introducing innovations that may eventually be conventionalized as permanent borrowings. It is crucial that we distinguish the processes from the results, if we are to understand the close links between classic CS and intertwined languages. The issue here was long ago recognized by Haugen, who noted that "borrowing as here defined is strictly a process and not a state, yet most of the terms used in discussing it are ordinarily descriptive of its results rather than of the process itself" (1950: 213). In the light of this, let us now examine typical examples of classic CS and language intertwining, and what they share in common by way of both process and result.

Classic code switching and intertwined languages

The kinds of 'classic' code-switching that Myers-Scotton (1993) and others have described clearly conform to the criteria for borrowing. Myers-Scotton (1993,

2002) proposed her Matrix Language Frame (MLF) model to account for such types of code-switching, as illustrated in the following examples:

French/Arabic switching (EL Arabic in italics):

(1) C'est une pauvre *bint* (Bentahila & Davies 1983: 319)
'She is a poor girl'

Hindi/English switching (EL Hindi in italics)

(2) Generally, *larakiyaan* are given *guriyaan* as gifts. (Pandit 1990: 48)
'Generally, girls are given dolls as gifts.'

Myers-Scotton demonstrated that, in these types of bilingual speech, one language, the recipient language in our terms, acts as the matrix language, that is, provides the morphosyntactic frame for the bilingual utterance, and that the features transferred from the 'embedded' language, the source language in our terms, include primarily content items, and more rarely, free function items such as conjunctions, adpositions, etc. (Golovko 2003).

There is, in principle, no difference between these kinds of insertion and those found in intertwined languages such as Media Lengua or Ma'á, except for degree, though the extent of lexical insertion in BMLs far exceeds even the most prolific cases of insertion in CS (Backus 2000, Bakker 2003). The following examples illustrate the results in BMLs:

Media Lengua (EL Spanish items in italics; Q refers to Quechua):

(3) ML: *No sabi*-ni-chu Xwan *bini*-skda-da (Muysken 1981: 68)
NEG know-1sg-NEG John come-NOM-ACC
"I don't know that John has come."

Q: Mana yacha-ni-chu Xwan shamu-shka-da
NEG know-1sg-NEG John come-NOM-ACC
Sp: No sé que Juan ha venido
NEG I-know that John has come

(4) ML: *Unu* *fabur*-ta *pidi*-nga-bu *bini*-xu-ni
(Muysken 1997a:365)
one favor-ACC ask-NOM-BEN come-PROG-1
"I come to ask a favor."
Q: Shuk fabur-da maña-nga-bu shamu-xu-ni
Sp: Vengo para pedir un favor.

Ma'á (Mous 2003: 212):

(5)	Ma'á:	áa-té	mi-hatú	kwa	choká
		3sg-PST-cut	4-trees	with	axe
	Mbugu:	áa-tema	mi-tí	kwa	izoka
		3sg- PST-cut	4-trees	with	axe
		"He cut trees with an axe."			
(6)	Ma'á:	w-áa-bő'i	koré	mé	
		2sg- PST-make	10-pot	how:many	
	Mbugu:	w-áa-ronga	nyungú	nyi-ngáhi	
		2sg- PST-make	10-pot	how:many	
		"How many pots did you make?"			
(7)	Ma'á:	tu-kw-áho	lu-'iréno	tu-ta-bódi	
		1pl-COND-see	11-sleep	1-pl-EVI-sleep	
	Mbugu:	tu-ku-vóna	lu-ghóhe	tu-ta-jasi	
		1pl-COND-see	11-sleep	1-pl-EVI-sleep	
		"If we are tired we have to sleep."			

This kind of insertion of course corresponds exactly to the workings of recipient language agentivity. Clearly, the linguistically dominant language in these kinds of bilingual mixture is the matrix language, in the sense that it supplies the grammatical frame, which is not affected by the borrowing. From a psycholinguistic perspective, it is dominant in the sense that it "controls" the language production process, particularly at the level of grammatical encoding.

"Island" insertion

We also see similarities between insertional CS and mixed languages in patterns involving switches of phrasal constituents, for example, the phrases in italics in examples like the following:

Arabic/French codeswitching (Bentahila & Davies (1983: 312):

(8) *Les gens* mabqaw jxalSu:
'The people stopped paying.'

Japanese/English code switching (Nishimura 1986: 128)

(9) *Only small prizes* moratta ne.
get-PAST
'(We) got only small prizes, you know.'

Hindi/English CS (Pandit 1990: 45)

(10) John gave a book *ek larakii ko*
a girl to
'John gave a book to a girl.'

Once more, these kinds of island insertions have parallels in bilingual mixed languages such as Michif, as illustrated in the following example from Bakker's field data, cited in Matras & Bakker (2003: 3). (French items in italics):

(11) Kayâs *une fille La Cendrieuse* kî-isinihkâ-sô-w
long-time-ago a-F girl The Cinderella PAST-name-REFL-3
avec o-mâmâ-wa kî-wîki-w *puis trios ses* *soeur(s)*
with POSS-mother-OBV PAST-live-3 and three POSS-PL sister
La Cendrieusse mâka *tout* kî-piskeyiht-am *tout*
The Cindrella however all PAST-clean-it all
la maison, le plancher kî-kisîpêkin-am
the house, the floor PAST-wash.by.hand-it
'A long time ago there was a girl called Cinderella. She was living with her mother and her three sisters. Cinderella, however, cleaned everything. She washed the house, the floor.'

Given that the patterns of language mixture described above for code switching and bilingual mixed languages are so common, and clearly the most frequently encountered type we find, it is difficult to understand objections raised against the very concept of matrix language, for instance by Gardner-Chloros & Edwards (2004: 117ff). They claim that "in many instances of CS the notion of a 'base system' is either irrelevant, or fails to explain the facts" (2004: 103). But this is certainly not true in cases of insertional CS, though other kinds of code-switching involving what Myers-Scotton calls a "composite Matrix Language frame" are more problematic for the concept of matrix language. Even when the morphosyntactic frame of the ML may not be identical with that of the recipient language, its grammatical structure is still amenable to analysis. Thus I would agree entirely with Gardner-Chloros & Edwards (2004: 125) that 'It makes sense to extract the rules which speakers appear to be following *from CS data*, rather than bringing to the analytic task a baggage of rules which have been developed in quite a different context and which may have little relevance" [italics in original].

Language dominance and code-switching

Let us now consider how the notion of language dominance, integral to both van Coetsem's framework and to models of language production, can be understood in relation to classic code switching behavior and related contact-induced change. Pyscholinguistic approaches view dominance relations between languages in code switching in terms of which language is more activated in the production of code mixed utterances. Myers-Scotton's notion of 'matrix language' is in fact specifically defined as the language that is more activated in the production of mixed speech. More accurately, the ML is the language whose grammatical encoding procedures are more activated. Gardner-Chloros & Edwards (2004: 119) question this claim, arguing that "Exactly what is to be understood by 'activated' and how this translates into grammatical terms is, however, not specified." They argue:

> "There is no explicit connection between the language which is more activated in the brain and the grammatical frame of a sentence – even if such activation were amenable to empirical verification."

This does more than just challenge the claim that the linguistically dominant language is the one that is more activated in classic code switching. It also challenges approaches that assume that language dominance is reflected in the psycholinguistic processes that produce bilingual speech, and more specifically the morphosyntactic structures that frame bilingual speech. This idea is, of course, fundamental to van Coetsem's notion of recipient language agentivity in borrowing.

Van Coetsem's view of language dominance as a crucial factor in determining the outcomes of language contact is quite in keeping with psycholinguists' views of the role of dominance in language production. Grosjean's (1997) suggestion that bilinguals can operate in either 'monolingual' or 'bilingual' mode, or at different points on the continuum between the two, is highly relevant here. He notes that even when one language is clearly dominant, as in the monolingual mode, deactivation of the other language is rarely total, as clearly seen in the innovative mixtures bilinguals produce. Since bilinguals have at their disposal two language networks that are both independent and interconnected, they can draw from different components (lexical, syntactic, morphological) of each. In both lexical borrowing and classic code switching involving single content morpheme insertion, they activate the morphosyntactic procedures of the RL as the dominant language, and selectively introduce lexical items from the source or embedded language. This is basically the same strategy that creators of intertwined languages employed in fashioning languages such as Media Lengua and Angloromani. In these cases, the dominant language could be defined simply as the language that is primarily activated in the language production process. Typically, as Bentahila & Davies (1992: 444) note, this will be the language that one is most proficient in, uses most, or acquires first. They distinguish this sense of 'dominant language' from Myers-Scotton's concept of "matrix language," which she had earlier (Myers-Scotton 1990: 66) defined as the language one is most proficient in, or as the more dominant language in the community in terms of the number of domains in which it is used, or as the language that is more unmarked for the kind of interaction in which the CS utterances occur. Bentahila & Davies' caution is justified, since the notion of language dominance here must be seen as a purely individual, not social property, in accordance with van Coetsem's approach. It would be particularly counter-productive to confuse linguistic dominance with social dominance.

More recently, Myers-Scotton (2002: 60) defines the matrix language as "the source of the frame providing morphosyntactic structure for the bilingual CP" [complement phrase – DW], and she notes that it has a larger and more central role in the relevant CP. Though she distinguishes the notion of matrix language as "a grammatically-based construct" (2002: 62) from the psycholinguistic concept of dominant language, I would argue that the two are in fact comparable in terms of the language production process. More accurately, perhaps, the matrix language is equivalent to what psycholinguists refer to as the "selected language" in bilingual language production. The selected language is the one that is more dominant (or more activated) in a particular instance of bilingual speech. I therefore maintain that, in cases of code-switching involving island insertion, there is a dominant matrix language – the one that supplies the Verb Phrase (VP) structure and the overall ordering of constituents. Thus, inserted islands can be seen as phrasal borrowings. This applies as well to bilingual mixed languages, for example Michif, in which French NP islands are inserted into a Cree morphosyntactic frame. Clearly, the phrasal procedures of the embedded language are activated in this type of language mixture, as part of the overall syntactic encoding process. One must assume that only bilinguals with a high degree of proficiency in both languages can accomplish this kind of language mixture.[4] In the following section, I discuss each of the two patterns of language mixture outlined here in turn. I first discuss the linguistic explanations that have been offered for each type, and then suggest how psycholinguistic models of bilingual language production might help clarify how such mixtures arise.

4. Ad Backus (pc 2008) suggests that, in the initial stages, only some French NP structures were borrowed into a Cree morphosyntactic frame as code switches, and later, French NP structure became conventionalized as part of Michif syntax. This seems quite feasible, and parallels the case made for the conventionalization of single content morpheme borrowings in intertwined languages like Media Lengua. In both cases, the important point is that the mechanism that led to the initial insertions was borrowing under RL agentivity.

Linguistic approaches to insertional code-switching.

Muysken (1981) proposed the Relexification Model as an explanation of the kinds of single item insertion found in Media Lengua – an intertwined language spoken by Indian peasants, craftsmen and construction workers in Salcedo and nearby villages in Central Ecuador. As we illustrated in example (3) above, Media Lengua is characterized by massive importation of Spanish lexical items, or, more precisely, their imitated phonetic shapes, into a Quechua grammatical frame. Muysken (1981: 61) describes these kinds of insertion as instances of relexification, which he defines as follows:

> Given the concept of lexical entry, relexification can be described as the process of vocabulary substitution in which the only information adopted from the target language in the lexical entry is the phonological representation.

Muysken (ibid.) illustrates the process as in Figure 1 (slightly amended from the original).

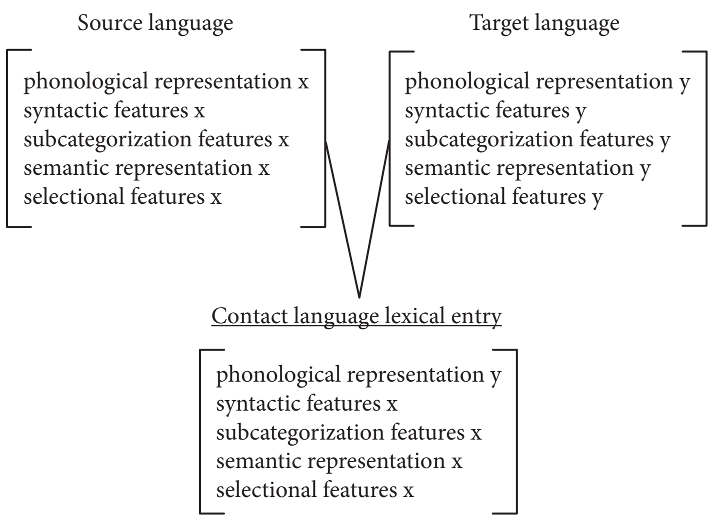

Figure 1. Muysken's representation of relexification

This model seems to imply that all that is involved in this kind of lexical insertion is the relabeling of a Matrix Language lexical entry that otherwise remains unchanged. But most linguists would argue that the borrowed Spanish items in Media Lengua, as in cases of lexical borrowing generally, bring along their own semantics, which they largely share with the Quechua items they replace.[5] We can assume that it is this semantic equivalence that facilitates the substitution of the RL lexeme by its SL counterpart. Apart from this, however, Quechua morphology, subcategorization properties, derivational processes, word order, etc., are all preserved intact in Media Lengua. It seems clear that the kind of lexical incorporation described here is not different from that which occurs in lexical borrowing and classic code switching. In all cases, SL lexical forms are imported and integrated into the unchanged structural frame of an RL. In other words, RL agentivity is involved in all these cases.

Relexification and language production

The relexification model, modified to take account of semantics, is compatible with language production models that attempt to explain the linguistic structure of bilingual speech by appealing to Levelt's (1989) model of how conceptual structures are mapped onto linguistic form in language production. It is generally agreed that three types of mental processes are involved: conceptualization processes that specify which concepts are to be expressed verbally; formulation processes that select appropriate lexical items and construct the syntactic and phonological structure of the utterance; and articulation processes that realize the latter as overt speech (Roelofs 1993: 108). The general outline of the model is shown in Figure 2 (Bierwisch & Schreuder 1993: 25).

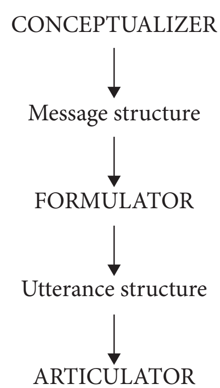

Figure 2. A simplified model of language production Levelt (1989)

5. I am grateful to Ad Backus for pointing this out to me.

According to this model, conceptual structures are the preverbal messages that form the input to the Formulator, "whose task it is to map the message onto linguistic form" (Levelt 1993: 5). The final output of the Formulator is "a phonetic plan that can be executed by the articulatory motor system" (ibid.). The Formulator performs two basic operations: grammatical and phonological encoding. As Levelt explains: "Grammatical encoding takes a message as input, retrieves lexical items from the mental lexicon, and delivers a surface structure as output" (ibid.). Lexical retrieval involves, first, accessing the lemmas associated with the relevant lexical item, and second, selecting the item's form specification or lexeme as it is stored in the mental lexicon. The underlying assumption of the model that most concerns us here is the idea that lexical access involves two stages: lexical selection (as part of grammatical encoding), and phonological encoding. Levelt (1993: 4) depicts this as follows:

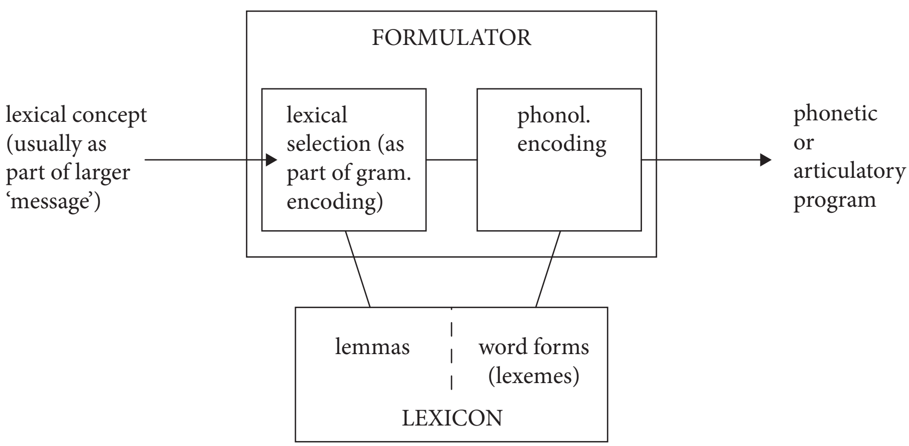

Figure 3. An outline of lexical access in speech production

De Bot (1992, 2001) has shown how Levelt's model can be adapted to account for bilingual speech production. As he points out, one of the crucial issues that the adapted model must face is how the bilingual lexicon is organized (2001: 430). More particularly, the model must account for how the selection of lexical items takes place in bilinguals, which in turn "entails the question of how the systems are kept apart or mixed depending on the situation" (p. 432). De Bot accepts Green's (1986) suggestion that there may be three levels of activation involved in plurilingual language production. First, there is a selected language that controls the speech output; second, there is an active language that plays some role in ongoing processing and works parallel to the selected language; and third, there may be a dormant language that plays no role in processing (De Bot, 2001: 433). According to this hypothesis, one language is always selected, but more than one language may be active or latent. Moreover, the active language may do everything the selected language does, such as retrieve lexical items, form sentences, generate surface structures, and even make a phonetic plan (ibid.). De Bot makes the important observation that "phenomena associated with fluent and frequent code-switching can be explained as a result of this kind of parallel production" (ibid.). I take this to mean that parallel production involving alternating activation of one or the other language at different levels of the production process explains the kinds of mixture we find in classic CS, and in the formation of intertwined languages.

Following from the above, we can assume that, in classic code-switching, the Matrix Language (ML) is the selected language, and controls the language production process as a whole. At the same time, the Embedded Language (EL) is also active to some extent, and there is access to EL lexical items. However, in the case of single content morpheme insertion, lexical selection targets EL lexical items, which are matched with lemmas belonging to ML lexical entries. Phonological encoding then produces EL lexemes, that is, the phonological shapes of the EL items, though these can be adapted to the articulatory phonetics of the Matrix Language. We can view this as simply replacement of one lexeme by another, without change in the lemmas associated with the lexical entry. This process of lexeme substitution is what Muysken's relexification model attempted to capture. As I suggested earlier, such substitution may be triggered by the fact that the lexemes in question are associated with the same semantic content, in other words, their lemmas overlap at the level of semantic form. In other cases, of course, bilinguals may switch to an EL lexical item because they do not recall, or know, its equivalent in the selected language.[6] What all of this suggests is that bilinguals can in fact attach the source language word to the RL lemma as an alternative phonological shape. Interestingly, this is the same suggestion that Pienemann (1999: 83) makes with regard to the way L2 items are selected and adapted to L1 lemmas in the early stages of second language acquisition. He notes:

> "If the L2 word is simply attached to the L1 lemma as an alternative morpho-phonological form, then the complete L1 syntactic information would be available upon accessing the lemma."

This seems, mutatis mutandis, to be similar to what goes on in cases of classic code-switching. It is also in keeping with Levelt's (1993: 17) view that

6. Obviously, as a reviewer points out, this claim about lexeme substitution needs to be tested by means of appropriate psycholinguistic experiments.

> "Lexical selection and phonological encoding are wildly different processes. Lexical selection is semantically (or syntactically) driven search for an appropriate item in a huge lexical store. Phonological encoding is the creation of an executable phonetic program for a single item in context."

Clearly bilinguals can keep the two procedures quite separate in producing code mixed utterances.

Insertion of EL islands

In the case of EL island insertion, we might again argue that the Matrix Language is the selected or dominant language, which controls the majority of the grammatical encoding and the speech output. At the same time, the Embedded Language is activated to the point where it controls the production of various phrasal categories. The idea that phrasal procedures can be separated from clausal or sentential procedures is not new. Researchers such as Levelt (1989) and Kempen & Hoenkamp (1987) have argued that sentence production is incremental or piecemeal, which means that "…the next processor can start working on the still-incomplete output of the current processor" (Levelt 1989: 24). In the course of syntactic encoding, constituent structures are built up one at a time, instigated by the activation of the relevant lemmas. As Pienemann (1999) suggests, each lemma contains categorical information that triggers the creation of a maximal projection. Thus, "category N builds NPs, V builds VPs, etc. …where these categories can take on the function of a head of a phrase" (1999: 66). Once a phrasal structure has been created, other syntactic procedures come into play to establish "a relation between the phrase and the rest of the intended message" (1999: 69). Phrases are attached to higher nodes in incremental fashion until the entire sentential structure is assembled. According to Pienemann, these processing procedures form a hierarchy that is implicationally ordered, represented as follows (1999: 80):

Subordinate clause procedure,
S-procedure,
Phrasal procedures,
Category procedures,
Lemma access

Pienemann argues that "the hierarchical nature of the list arises from the fact that the procedure of each lower level is a prerequisite for the functioning of the higher level" (ibid.). The aspect of Pienemann's claim that most concerns us here is the idea that phrasal procedures can in fact take place independently of, and as a prerequisite for, S-procedures. Also relevant is the idea that "the head of the phrase calls the phrasal procedure, based on the category information in the lemma" (1999: 80).

Applying this approach to cases of bilingual mixture involving island insertion, we can assume that the less dominant but still active language, the EL, controls the procedures that build phrasal constituents such as NPs, AdvPs, PPs, etc., while the ML acts as the selected language and controls the core predication, or the S-procedure. Hence the ML remains the dominant (more activated) language overall, and the insertion of phrasal constituents from the EL constitutes a type of borrowing under RL agentivity.

Mixed phrasal constituents

The kinds of EL islands discussed so far are cases where both the function and content morphemes that make up the inserted phrase come from the EL. There are other cases where phrasal constituents are made up of function morphemes from one language, and content morphemes from another, as in examples like the following:

Japanese/English CS. (Nishimura 1986: 132).

(12)	Kaeri na wa	*border* de	*we got stopped*, eh?	
	Return on TOP	border on		
	'On the way home, we got stopped on the border'			

Hindi/English CS (Pandit 1990: 50):

(13)	*Many*	larake	*interview*	ke liye	bulaaye	gaye the
		boys		for		called were
	but nobody was found suitable			*is* job	*ke liye*	
				this	for	
	'Many boys were called for this interview, but nobody was found suitable for this job.'					

Hindi/English CS (Pandit 1990: 44)

(14)	*Some Englishmen* ne	*tribal girls* ko	phusalaa liyaa
	Some Englishmen NOM	tribal girls ACC	seduce did
	'Some Englishmen seduced the tribal girls.'		

These types of mixed constituent have posed problems for both contact linguists and psycholinguists. I will first discuss some of the linguistic explanations that have been offered to account for them. Then I will suggest how the more plausible of these explanations can be interpreted in terms of psycholinguistic models of language production.

Some linguistic explanations for CS mixtures involving mixed constituents have appealed to structural constraints formulated by various researchers, including Poplack's (1980) 'equivalence' constraint, Di Sciulllo et al's (1986) 'government' constraint, etc. Such constraints attempt to rule out many kinds of mixed CS constituents on the grounds that they fail to conform to one or another structural rule or principle. For instance, Poplack's Equivalence Constraint stipulates that a switch is possible only if it involves no violation of the surface syntactic rules of either of the two languages. This would rule out, among others, switches in cases where constituents in the two languages do not exhibit the same surface structure. Hence it would disallow mixed constituents such as the prepositional phrase in (13) above, *interview ke liye*, which contains an English noun followed by a Hindi compound postposition. As scholars like Bentahila & Davies 1983, 1992), Berk-Seligson (1986), Pandit (1990) and others have shown, such constraints are far from universal, and indeed fail to apply in a surprisingly robust range of code-switching data. Since these constraints fail to even account for the facts of mixed constituents, they are obviously of limited value to psycholinguistic attempts to explain the processes involved in the production of such constituents. As De Bot (pc 2008) points out, these linguistic constraints are "post-hoc systematizations of the phenomena in question, and tell us little about the processes that lead to them." However, this does not mean that code-switching patterns are not amenable to syntactic or morphological analysis, nor that they fail to obey linguistic constraints. There is in fact evidence that such types of mixture are in fact subject to constraints that have to do with the rules regarding the grammar of maximal projections in one or the other of the languages involved. Constraints of this type seem much more compatible with psycholinguistic accounts of the production of mixed constituents.

For instance, Pandit explains the occurrence of such mixed constituents in terms of the following general constraint, which seems more defensible than previous suggestions such as those based on equivalence or government:

(16) Code switching must not violate the grammar of the head of the maximal projection within which it takes place. (Pandit 1990: 43)

This, she argues, follows simply from the more universal constraint that is basic to all languages, which is that "The grammar of the head of a maximal projection obtains in a maximal projection" (ibid.). Again, this is compatible with the view either language may control syntactic encoding at the level of both phrasal and clausal procedures.

Bentahila & Davies (1983) also provide many examples of mixed constituents in the Arabic/French code-switching data, which do not conform to the predictions of the Equivalence Constraint, but rather support Pandit's general principle. Consider the embedded NP island in the following, for example:

<u>Arabic/French code switching. Bentahila & Davies 1983: 311. (French in italics).</u>

(17) *Et si* waħed *ton inférieur* jǯi jhDar mǐak
And if one your inferior comes, you'll speak to him.
'And if one of your inferiors comes, you'll speak to him.'

Bentahila & Davies explain these mixed NPs by noting that their structure conforms to that of NPs in Arabic. Certain Arabic determiners (indefinite *waħed* and the demonstratives *had* 'this' and *dak* 'that' are subcategorized for an N" complement consisting of a definite article + noun, and this rule must be satisfied in mixed NPs, whether the N" is in Arabic or French (Bentahila & Davies 193:321).

(18) Haduk *les gens* 'these *the people*.' (Bentahila & Davies 193:317):
Dak *la chemise* 'that *the shirt*'
Waħed *le liquide* 'one *the liquid*'

Bentahila & Davies' data led them to propose the following general constraint:

(19) All items must be used in such as way as to satisfy the (language-particular) subcategorization restrictions imposed on them. (1983: 329).

Like Pandit's general principle, this means that any particular phrasal constituent within which code switching occurs must be constructed in accordance with the rules specific to one or another of the languages involved. If this is the case, it would account for many other CS phenomena similar to those just described, which have proven difficult to explain in terms of linguistic constraints based on structural equivalence, government, and the like. More discussion of the failure of such constraints can be found in Berk-Seligson (1986), Nortier (1990). Eliasson (1989) and others. See Gardner-Chloros & Edwards (2004) for a fuller discussion.

Mixed constituents such as those we have found in cases of code-switching are also attested in bilingual mixed languages. For instance, we find mixed postpositional phrases in Michif consisting of a French locational phrase followed by a Cree postposition – a pattern quite similar to that of mixed postpositional phrases in Hindi-English code-switching.

(20) Michif *dã* *lɨ* *frɨj* uhči
in the fridge from
'out of the fridge'

We also find clear parallels between Arabic/French code switching and Michif in the construction of mixed NP constituents. Plains Cree, the ML for the formation of Michif, has a similar requirement regarding the subcategorization of demonstratives, which is preserved in the relevant mixed NPs of Michif (examples from Bakker & Papen 1997: 328).

(21) a. awa *la fij*
This the (fem) girl = 'This girl.'

b. U:ma *la bwɛt*
This the (fem) box = 'That box.'

It seems then that both mixed constituents in both composite CS and bilingual mixed languages follow similar constraints on their structure. This provides further evidence that the processes involved in code switching have strong parallels in those that led to the creation of mixed languages. Further support for this comes from the fact that frequent code-switching between French and a dialect of Montagnais – a language closely related to Cree – is producing a language very similar to Michif among young people in a French-Montagnais bilingual community studied by Drapeau (1980). Bakker & Papen (1997: 355) cite this as an argument "in support of the view that Michif is nativized code-switching."

From a psycholinguistic perspective, we can assume that phrase-building procedures that involve mixed constituents are in fact governed by the lemmas associated with the relevant head. In the cases of mixed NPs cited from Arabic/French codeswitching and Michif, the head is the determiner, whose lemma activates the building of an NP containing an N" phrase inserted from an EL. In such cases, it is the language from which the determiner is selected that guides the phrasal procedure, and acts as the dominant language. Hence the insertion of the EL N" constituent is also consistent with borrowing under RL agentivity.

To summarize, I have tried to show that certain linguistic accounts of the insertion of full EL islands as well as the production of mixed islands are in fact compatible with psycholinguistic models of language production. I have argued that the insertion of EL islands into a Matrix Language morphosyntactic frame, as discussed by Myers-Scotton and others, can legitimately be viewed as a case of borrowing under RL agentivity. In this case, from a psycholinguistic perspective, the matrix language is selected as the dominant language that controls the S-procedure or core predicative structure of the utterance. The EL is also activated, and controls the procedures that build the phrasal constituents that are adjoined to the core predication. In these cases, then, the notion of borrowing is consistent with the notion of parallel production, as discussed by de Bot (2001). In other cases, phrasal constituents may themselves be mixed, with elements from both languages. Previous attempts to account for such mixtures in terms of linguistic constraints based on equivalence or government have proven inadequate, and are therefore not a promising basis on which to link linguistic and psycholinguistic explanations. However, the more general linguistic principles offered by scholars like Pandit and Bentahila & Davies do seem to explain the nature of the mixture, and are more compatible with a psycholinguistic approach to mixed constituents. These principles state simply that CS must not violate the grammar of the head of such mixed phrasal constituents. In other words, the overall structure of the phrase is determined by the syntactic properties, particularly the subcategorization requirements, of the head, which may be selected from either language. Once these are satisfied, lexical items from the other language may be inserted into the phrasal structure. Thus, an Arabic demonstrative such as *dak* 'that' can govern a French NP consisting of a determiner + noun, since this satisfies its subcategorization requirements. From a psycholinguistic perspective, we can assume that information about the subcategorization properties of such heads is contained in their lemmas. We can further assume that the phrase-building procedures that produce mixed constituents are in fact controlled by the lemma associated with the relevant head.

Conclusion

We have seen evidence that various types of language mixture typical of code-switching among fluent bilinguals are also found in bilingual mixed languages, where they have been conventionalized as the result of sociolinguistic factors. The comparisons we have made here further suggest that the (psycho-)linguistic processes involved in the two kinds of bilingual language production are the same. At this stage, we still know very little about the way these processes work, or what guides or constrains them. Determining the precise parallels between the kinds of mixture found in the two situations is a matter for further empirical investigation. It would be particularly useful to conduct experimental studies with speakers of mixed codes such as Sheng and Tsotsitaal, which are still in process of formation. The findings of such studies will no doubt shed much light on our understanding of the creativity that bilinguals display in both code-switching and the construction of bilingual mixed languages.

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CHAPTER 12

Codeswitching as one piece of the puzzle of language change

The case of Turkish *yapmak*

Ad Backus
Tilburg University

This chapter argues that theories of contact-induced language change should carefully separate out synchronic and diachronic aspects of the process, and that a combination of psycholinguistic and sociolinguistic methods is needed to arrive at empirical evidence for the claims that such theories develop. This is illustrated through an analysis of the Turkish auxiliary verb *yapmak* 'do', which has undergone an extension of its usage possibilities in the contact setting of Turkish immigrants in The Netherlands. The various ways in which it is used are exemplified, the possible origins of the extensions are examined and hypotheses are advanced about how the various changes in which it is implicated have spread. The article concludes that the various extensions are probably not related and have different origins, and that in some cases direct psycholinguistic evidence for or against empirical claims should be a future possibility.

Introduction

The primary goal in writing this chapter is to argue four things, all needed to accommodate different aspects of language contact now insufficiently integrated in theoretical accounts of contact and change: first, that we must carefully separate out synchronic and diachronic issues in language contact research; second, that both dimensions must figure in any integrated theory of contact phenomena; third, that corpus and psycholinguistic data are both needed to test such a model; and, finally, that codeswitching and contact-induced structural change should be treated together, in the same model.

The data I will use to illustrate these points come from corpora of spontaneous informal interaction in Turkish as spoken by the large Turkish immigrant community in Holland. This community has its origins in labor migration that started in the mid-1960's; through family reunification and marriage, immigration has continued up until the present. The community has a significant presence in Dutch cities, but has fairly low socio-economic status. The most crucial aspect for understanding our present concerns is that Turkish is maintained to quite a significant degree as the major language of in-group communication, though this should not be taken to mean that Dutch is absent from the linguistic repertoire: most speakers are thoroughly bilingual (cf. Backus 2004 for an overview of linguistic work on this community). In this chapter, I will particularly focus on developments in the use of one particular Turkish verb: *yapmak* 'to do'. This is done in the second half of the article; first, I will present my theoretical claims in the next section.

The complementarity of psycholinguistic and sociolinguistic approaches in the study of language change

Explaining contact-induced change requires an explanation of innovation (the starting point of change) and of diffusion (the spread of changes in society), both issues that are studied in sociolinguistics, with its use of corpus data that reflect everyday language use in bilingual contexts. However, it also requires an explanation of how an individual speaker's competence changes, given that what we recognize as 'language change' is the cumulative result of many equivalent changes in (most of) the individual idiolects that make up that language. The latter issue is a typical psycholinguistic topic, as it depends on direct access to the bilingual brain's processing and planning operations.

Unfortunately, psycholinguistic and sociolinguistic studies of bilingualism tend to work in isolation from one another. Though journals devoted to the topic tend to include contributions from both sides, and practitioners do meet at conferences, there is very little actual multidisciplinary research that combines the two angles. However, investigating usage patterns in corpora generates hypotheses about competence that should be tested, if possible, with psycholinguistic experiments. It should be noted that psycholinguistic testing of linguistically motivated hypotheses is standard procedure in usage-based approaches towards language (e.g. Tomasello 2003; Croft 2000; Langacker 2008); I propose we turn to that work for inspiration as to how to integrate sociolinguistic and psycholinguistic approaches to bilingualism.

Sociolinguistic corpus studies

Many of the (socio)linguistic studies of codeswitching have the following format: one or more spontaneous conversations featuring bilingual speech are recorded and transcribed, all codeswitches are extracted for analysis, these are divided into various types, and a quantitative analysis is provided. Parts of the resulting data set are then used to prove or disprove claims made earlier in the literature, e.g. the predictions for intrasentential codeswitching made by the Equivalence Constraint (Poplack 1980) or the Matrix Language Frame Model (Myers-Scotton 2002).

Examples (1–5) illustrate codeswitching and various subtypes. Example (1) is a typical case of insertion: Dutch content words are inserted into a Turkish clause. The insertions may be internally complex, as in Example (2), where the sequence *op kamers wonen* is inserted into a Turkish clause. The sequence is a fixed expression in Dutch, and as such expressions often do when we see them inserted as a codeswitch, it describes a concept alien to the other, in this case Turkish, culture. Giving a precise English translation isn't easy either: it means 'rent a room in a house where several other students also rent a room and where they live unsupervised throughout their college years' (see Backus 2001 for discussion of why insertional codeswitches often involve such highly specific semantics). Structurally, it is an instance of insertional codeswitching, more precisely of a Dutch unit consisting of a prepositional phrase and an infinitival verb, which in turn combines with Turkish *yap-*, 'do', in a mixed constituent.

(1) *Nachttrein*-i orda *Randstad*-da dolaş-ıp
night.train-POSS there *R.*-LOC go.around-CONJ
dur-uyor[1]
keep-PROG.3sg
'The *nighttrain* keeps going around there in the *randstad* [=metropolitan area in Western Holland].'

(2) *op kamers wonen* yap-acağ-ım
on rooms live do-FUT-1sg
'I'm going to *live on my own*.'

Since codeswitching studies tend to have a strictly synchronic outlook, there is relatively little attention to any differences that may exist among foreign words in the degree to which they are integrated into the host system. For the syntactic integration of these words, indeed it doesn't matter much whether they are established loanwords or so-called 'nonce loans', since either way they are generally inserted into the grammatical frame of the borrowing language (cf. Winford 2003

1. In this and all examples, all text in italics is Dutch; the rest is Turkish. The following abbreviations are used: ACC=Accusative; AOR=Aorist; COND=Conditional; CONJ=Conjunction; DAT=Dative; DER=Derivational marker; FUT=Future tense; GEN=Genitive; IMP=Imperative; INF=Infinitive; LOC=Locative; NEG=Negative; PAST=Past tense; pl=plural; POSS=Possessive; PROG=Progressive; PRTC=Past Participle; Q=Question marker; sg=singular

for discussion). The Dutch word *lenen* 'to borrow', for example, inserted into a Turkish clause in Example (3), is widely regarded in the Turkish community as an established loan from Dutch. The basis of this judgment is difficult to ascertain, but most likely it is based on a certain frequency of usage. In any case, the word is used structurally in exactly the same way as a Dutch verb that is used for the very first time.

(3) ben seninki-si-ni ***len-en*** yap-mak
I yours-POSS-ACC ***borrow***-INF do-INF
iste-di-m *toen had ik ze al*
want-PAST-1sg then had I them already
'I wanted to ***borrow*** yours *but then I had them already*.'

Usually, codeswitching data sets contain both insertional and alternational switches; Example (4) illustrates the latter: the two coordinated clauses are each in a different language. Authors who focus on the communicative motivations for codeswitching tend to separate out these alternational switches for further analysis.

(4) sen de kalkman lazım onlarla *en hoe moet je dan op de rest letten*?
you and get.up.your necessary with.them and how must you then on the rest check
"[when they get up to dance] you must get up with them as well, *and then how can you keep an eye on the rest?*"

Finally, corpora will always contain some examples that don't look like prototypical insertion or alternation, as in Example (2) above. Example (5) involves double marking of the existential meaning, and general mixture of two grammatical systems within the same clause; in general, this kind of CS is common when contact is between closely related varieties, such as between English and Dutch. The effect is that it becomes hard or impossible to establish a base or matrix language for the clause (cf. Muysken 2000, who calls this type 'congruent lexicalization'). This type of CS is even harder to identify if the varieties in contact are so closely related, for example when two dialects of the same language are mixed, that it is often impossible to tell which aspects of a clause are from which dialect. What we end up with is the same phenomenon as what sociolinguists call 'language variation': the differential selection of two or more variants, presumably governed by a range of linguistic and extralinguistic factors.

(5) *Dus in Nederland* ***zijn*** *zoveel* devlet
so in Holland **are.3pl** so.many state
hastane-si **var** mesela, *particulier*
hospital-POSS.3sg **there.are** for.example private

değil de, devlet
not and, state
'*so in Holland* ***there are*** *so many* state hospitals, for instance, not *private* but state.'

Classical codeswitching studies often ignore other contact phenomena also contained in the corpora, notably loan translation and grammatical interference. Example (6) features, in Turkish words and morphemes, a semantic combination directly imported from Dutch. Note that the two phenomena have in common that the lexicon of one language influences the lexical choices made in the other. At some level of theory formation, it seems that this common aspect should be explained, as well as the factors that govern which of the two surface outcomes is likely to be produced. Interference[2] is illustrated in Example (7), in which the use of the demonstrative pronoun as a type of article in a pejorative construction is imported from Dutch. The argument advanced for inclusion of loan translations in the analysis holds here, too: while the effects become more 'structural' as the pivotal element becomes more 'functional' (function word, affix) rather than 'lexical' (content word), the change still involves contact-induced alterations in the inventory of forms in the base language.

(6) **suç**-u bana **ver**-di
guilt-ACC to.me **give**-PAST.3sg
'he accused me'
(cf. Dutch: *de schuld geven*; 'give the guilt'; Turkish *suçlamak* 'accuse': suç-la-mak 'guilt-VERBALIZER-INF')

(7) yani kendi-m-i ifade et-mek
so self-POSS-ACC expression do-INF
ist-er-se-m bile ed-e-mem
want-AOR-COND-1sg even do-can-AOR.NEG.1sg
çünkü **o** sözcük-ler-i bul-a-mam
because **those** word-pl-ACC find-can-AOR.NEG.1sg
'so even if I want to express myself I can't because I can not find **those damn** words'
(cf. Dutch *ik kan* ***die*** *woorden niet vinden* ('I can **those** words not find'); Turkish *çünkü sözcük-ler-i bul-a-mam*)

2. The term 'interference' has been invested with many, mostly negative, connotations since its influential use in early contact linguistics by Weinreich. I don't intend any of these connotations by my use of the term here, and see it as roughly synonymous with 'structural borrowing', 'convergence', 'transfer(ence)' and 'contact-induced change'.

To my mind, three aspects of the sociolinguistic codeswitching tradition have been responsible for keeping these phenomena largely separated, even though they tend to co-occur in the same data. First, there is the focus on overt forms from the other language, which has established codeswitching as a separate field, and which has shielded off insertional and alternational codeswitching (overt forms) from all other contact effects (structural, or 'covert' forms). Second is the synchronic outlook of most codeswitching studies. Interest has focused on the synchronic selection of words from the base or source languages; since this mostly pertains to content words, questions of diachronic grammatical change rarely come to the fore. The situation is very different for grammatical elements: studies of contact effects in this domain naturally gravitate towards questions of change (e.g. Silva-Corvalan 1994). Finally, the separation of lexicon and syntax that underlies much linguistic theorizing also mitigates against combining codeswitching, a lexical phenomenon, and grammatical interference, a syntactic phenomenon. Voices such as Owens (1996), Johanson (2002), Myers-Scotton (2002) and Clyne (2003), who insist that all these phenomena should be studied together, are comparatively rare. Yet, as all phenomena mentioned are manifestations of cross-linguistic influence, the hypothesis that they are guided by the same mechanisms is plausible and should be investigated. If it is confirmed, we can make a more inclusive generalization; if it is falsified, we have a more legitimate reason to treat such data separately in the future.

Note that the separation of syntax and lexicon has been challenged in Cognitive Linguistics (Taylor 2002), a tradition in which an individual speaker's linguistic competence is defined as his/her inventory of meaningful units. All units combine a form and a meaning, even lexically empty syntactic structures, which still have a form by virtue of their constructional template, and have a meaning because they indicate such things as declarative, interrogative, or passive meanings.

The primary interest of bilingual corpus data for linguistics lies in its unique contribution to the basic question (which must be answered by any theory of language) how and why language changes, and what constrains change. While the present section surveyed the range of relevant data, the next subsection will start looking at the various components of the change process that need to be integrated in a coherent theory of the phenomenon.

Change: Synchrony and diachrony

Though there is no universally agreed upon theory of contact-induced language change, [3] there is a rich literature, focusing on particular aspects or types of change, as well as many case studies. Against this background, Backus (2005) suggests a general model of change that combines insights from especially Croft (2000), Johanson (2002) and Thomason (2001). I propose an amended version of that model in this section.

If we assume that language change is driven by what speakers do in everyday interaction, a theory of change requires first of all linking the synchronic and diachronic planes. The synchronic dimension refers to the choices speakers make during interaction; the diachronic dimension to the long-term effects of those choices on the system.[4] To understand language change from a usage-based perspective is to understand how everything we say (synchrony) has implications for how our idiolect develops (diachrony). Every instance of speech data, as they are used in corpus-driven linguistic investigation, captures one unit of language production, what I will call a Synchronic Event. A corpus, then, is a collection of random Synchronic Events in sequence. The most logical unit to focus on as 'the basic synchronic event' is the utterance, but every utterance is, of course, built up out of many elements: the production of each such element is itself also a Synchronic Event.

For the aspect of the data one wishes to focus on (be it a syntactic construction or the manner of pronunciation of a particular word, or anything else of interest), the particular Synchronic Event caught on tape may be referred to as *Synchronic Event n*. If the unit of analysis has never been produced or heard before, as will be the case for most complete utterances, it is *Synchronic Event 1*. For the types of things linguists tend to investigate, it will be very rare to actually capture this very first Synchronic Event (which we will call the 'innovation') in the data, and, even more likely, you may never know it if you have. More importantly, it should be emphasized that the production of any Synchronic Event was made possible by the current state of the speaker's competence. This competence has been built up diachronically. What made *Synchronic Event n* possible was the entrenched knowledge of that unit, accumulated on the basis of numerous earlier Synchronic Events (*1, 2, 3 … n-1*). In contrast, what made *Synchronic Event 1* possible was the entrenched knowledge of a schema, a pattern, etc, that made the unique creative

3. To what degree linguistics needs a separate theory of contact-induced change, or rather just one general theory of change, is an interesting issue, but, in my view, much comparative work remains to be done before we can know the answer.

4. This use of the term 'diachronic' covers more than just the pre-occupation with a feature's origin. It basically concerns all developments over time.

combination that is *Synchronic Event 1* possible (an extension of the schema that is close enough to established units to be judged 'acceptable').

A speaker's competence consists of the knowledge of numerous entrenched units at various levels of abstraction. For example, to produce the Turkish part of Example (3) above, knowledge of the following conventions, among others, must have been part of the speaker's idiolect: that OV order is normal, that Dutch words can be used in a context in which a bilingual mode is an acceptable way of speaking, and that *lenen yap-* is the conventional way to convey the meaning 'to borrow' in the Dutch immigrant variety of Turkish. The speaker has this knowledge because of earlier Synchronic Events (*used* productively and *heard* passively), including: numerous utterances with OV word order (and the relatively low frequency of other orders), numerous utterances containing Dutch words, and earlier uses of *lenen yap-* (and relatively few uses of alternative forms, such as Turkish *ödünç al-*).

Innovation and propagation

Any 'change' must have had its first occurrence once: the **innovation** (or *Synchronic Event 1*). Most likely, innovations occur several times, even in the same idiolect, before they start to be recognized as a somewhat established variant. Once speakers and hearers do recognize them as familiar, however, they are **entrenched** units, whose continued selection in running speech serves to **propagate** a change. Every synchronic utterance, whether produced or heard, updates the speaker's and hearer's running diachronic record.

In order to construct a good descriptive model of change, at least two dimensions of the process should be distinguished: time and causation. The temporal dimension consists of the sequence of two steps: instantaneous innovation and gradual propagation (or diffusion), the process whereby what was once an innovation becomes entrenched, i.e. becomes a conventionalized feature of the idiolect, and, as it spreads through the speech community, of the language. While innovation is studied indirectly (any element we use must once have been used for the first time, and we can hypothesize about what brought its use about), propagation has been the subject of much direct study in sociolinguistics, in the shape of longitudinal or cross-sectional variation. Note that this work looks at propagation at the level of the speech community; propagation at the idiolect level is simply assumed. Yet, the idiolect level is where we need to be if we want to know whether differing degrees of entrenchment are psychologically real; investigating how a form gets more and more established in the mental lexicon requires psycholinguistic testing.

Theoretically, the contact effect we observe in our data may have taken place for the first time exactly when those data were collected: in that case, we were lucky enough to capture the innovation. This is not very likely, though, as simple mathematics makes clear: if our corpus contains one hour of speech, that's only one out of the ten hours the speaker may have produced that day, and one out of the 70 hours he produced that week, and one out of the perhaps 35000+ hours he produces every year. Chances are that 'new' usages we discover in the corpus were not really 'new' usages, in the sense of actual innovations, for the speaker at the time of speaking. Yet, that's often how we report them, in synchronic terms, so we talk about a word of foreign origin as a new word (a 'codeswitch', a 'copy', as opposed to 'one of the established words appropriate in the given context'), or about a structural feature of foreign origin as a case of 'interference' or 'convergence'. We portray these data as exhibiting 'creative use' of new elements. That first usage, the innovation, is what we linguists are interested in, I think: we want to know what the social and linguistic factors and psycholinguistic mechanisms are that produced the switch, the case of interference, etcetera. We wish to know what caused the change, and why it took place when it did (cf. Weinreich, Labov & Herzog's 1968 discussion of the *actuation problem*). This is what models and theories are generally about, more than about how changes spread, and I will address it in a bit more detail in the next subsection.

One modification of this picture is in order, though. While in matters of narrow syntax, morphology and lexicon, it may be true that few things in an utterance constitute an innovation, it is also true that few utterances contain nothing new at all. As is often shown through Conversational Analysis, every utterance involves unique context-bound interpretations of lexical items, ways of construing the information to be conveyed, pronunciation details and other aspects of the synchronic speech event. All language production is done in social interaction, and every interaction is unique (though highly stylized interactions, such as airline traffic controllers' interactions with pilots, auction sessions, or stage plays, limit the degree of freedom to deviate from the script, cf. Wray 2002). Much of the current work in interactional sociolinguistics and discourse analysis focuses on precisely these creative aspects, leading to the postmodernist conceptualization of conversations as always involving 'negotiation'.

It is always possible that the newish variant representing change in progress was produced intentionally in the data we happen to look at, for example because the speaker wanted to be creative, or modern, or whatever. However, generally speaking we can expect the synchronic choice to use a particular element to be unintentional if that element is relatively entrenched in the *receiving* language. In such cases, the newish variant, e.g. the Dutch-Turkish compound verb *lenen yap-* for 'to borrow' (cf. Example 3 above), is simply seen as the conventional choice, the word everyone now uses instead of the less entrenched *ödünç al-*. It has stopped representing the creative use of a handy Dutch word, i.e.: it has stopped instantiating codeswitching in the literal sense. The implication of all this is that most 'codeswitching' in corpora is not actual "codeswitching" in that literal sense (i.e. an intentional switch to the other language system), but rather a "monolingual" phenomenon: the selection of a newish variant (which happens to originate in the other language), at the expense of its original base language equivalent. Note that while this may not match our way of talking about codeswitching very well,[5] it does match common intuitions about 'interference' (meaning on-going contact-induced structural change, or convergence *as a process*, cf. Toribio 2004): the unintentional use of a pattern well entrenched in the other language, at the expense of its base language equivalent, which then necessarily is becoming less entrenched. As a result, propagation unfolds the same way for lexical and grammatical changes: it is driven by the **selection** of Variant X rather than Variant Y, and in the case of contact-induced change, Variant X originates in another language. That is not to say that the psycholinguistic mechanisms driving the selection of lexical and grammatical elements are the same; in fact, they are likely to differ. Studying these mechanisms is important, as it will provide us with insights into what should be salvaged from the syntax-lexicon division if a strict modular view is given up.

Repeated use (i.e. the occurrence of many similar Synchronic Events) engenders conventionalization, i.e. establishing or strengthening the conventions. These conventions may be overtly recognized by the members of the speech community as **norms**, ranging from preferred usage of particular words (rather than certain alternatives) to the choice of a particular language (rather than another one) in particular communicative situations, cf. Myers-Scotton's 1993 on the supposedly innate 'markedness metric' that allows people to recognize whether a particular language choice is marked or unmarked. Divided over the traditionally recognized types of contact-induced change, this means that repeated usage effects further entrenchment of new words (borrowings, loanwords), of new usages of native words (lexical change, loan semantics, loan translation), and of new structures (structural change, convergence *as a result* – if the new structure is clearly entrenched enough to be called 'borrowed').

Causes of change

Despite the near-impossibility of directly observing those innovations that will lead to change, the causal dimension has gotten most of the attention. While language's changeability has been taken as given (though the fact itself is, as yet, insufficiently

5. Don Winford (p.c.) has brought it to my attention that this issue really does figure in the codeswitching literature, specifically in the distinction between nonce loans and established borrowings (cf. Sankoff, Poplack & Vanniarajan 1990). While that's certainly true, I still think that nonce loans are often too easily assumed to be synchronically taken from the other language by the speaker who uses them in an utterance. Many nonce loans in cited examples may very well be entrenched lexical elements in the base language for that speaker, i.e. established loanwords. They are somewhere down the propagation path, and this diachronic aspect of the borrowing process does not figure much in the codeswitching literature.

explained), why we get the changes we do has been the focus of intense research (for a convenient starting point, see Weinreich, Labov & Herzog 1968).

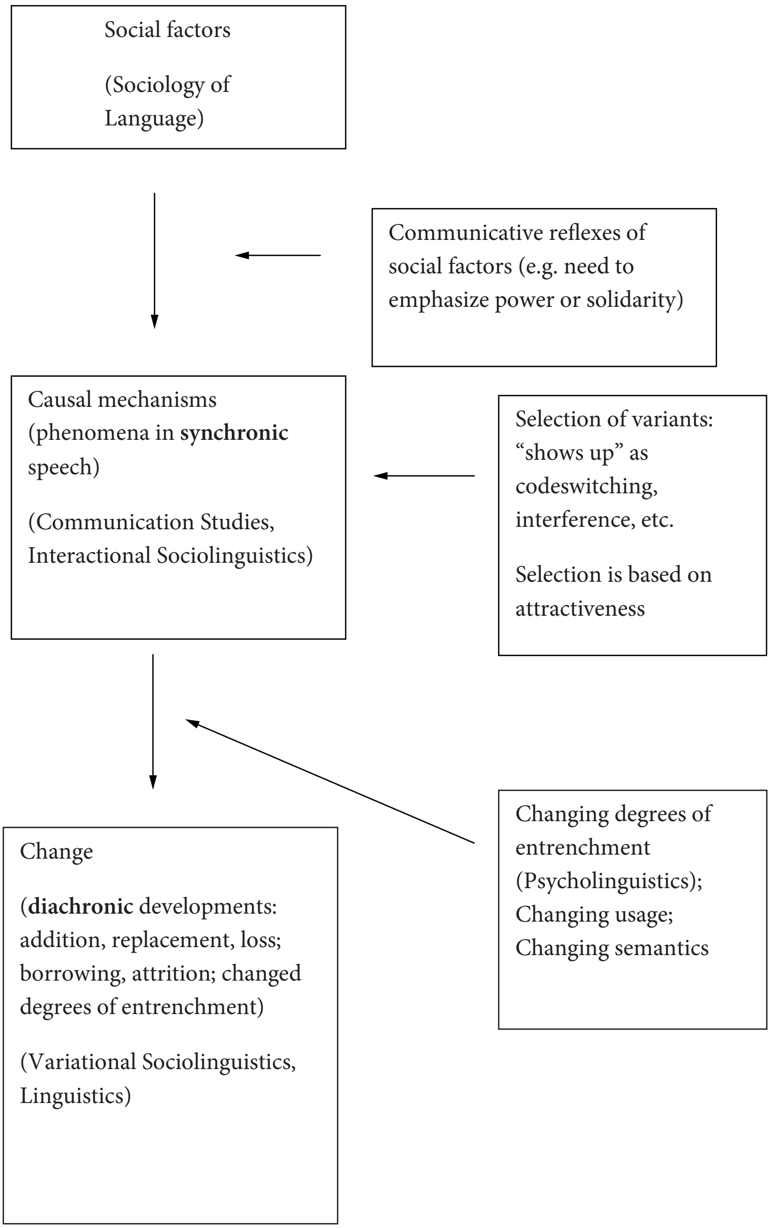

Figure 1. Model of language change

For the causal dimension, at least three levels need to be distinguished: the social, the communicative, and the linguistic level. Figure 1 is an attempt to capture this schematically; it also indicates which branches of linguistics tend to deal with which aspect.

All change, or at least all contact-induced change, is ultimately caused by *social* factors. The macro-sociolinguistic literature shows how the social circumstances in which people find themselves lead not only to contact between people speaking different languages, and from there to bilingualism, but also often to asymmetry. Groups rarely have equal status, and because of this asymmetry, their languages don't have equal status either. As a result, speakers of the weaker language will often be bilingual, while speakers of the stronger language remain monolingual (or at least will not learn the weaker language; they may of course be bilingual in their own and an even more prestigious language). This, ultimately, is the reason why the weaker language will undergo contact-induced changes over time, but its explanatory value is rather limited. Important as social factors are in the explanation of change, I won't go into the matter further here, as this requires cooperation with social scientists, clearly a desideratum for future studies. Still, there is still a lot to explain for linguistics proper. Status asymmetry, for instance, cannot explain why certain aspects of the dominant language are taken over but not others, nor can it explain how exactly borrowed features end up in the weaker language, i.e. through what mechanisms such changes take place.

These mechanisms, often called 'causal mechanisms' (Croft 2000), because they play a role in causing language change, are part of the *communication* process. If diachronic change results from the fact that all usage events leave traces in memory, and usage primarily takes place in face-to-face everyday conversations, we must look at what people do in conversation to find out what causes change. Stripped down to its essentials, change simply occurs because people decide to choose one variant over another in actual conversation, be it a word, a structure, an idiom, a way of phrasing or pronouncing something, etc.

When we talk about communicative decisions, it appears we are talking about conscious, or intentional, decisions, but the term shouldn't be understood in that sense. In fact, such decisions can be fully unintentional. Presumably, every utterance we produce is the result of a mix of conscious and unconscious choices. To a certain extent, issues of creativity, of finding the right words, of wishing to emphasize a point, of indexing a certain social position, etcetera, are the targets of deliberate choices. That this is the mechanism through which cultural loanwords enter a language is often implicit in discussions of borrowing and codeswitching. On the other hand, lexical, grammatical, and certainly most phonological choices tend to be completely under the radar, and produced more or less automatically. That doesn't mean that the question of what motivates their use is uninteresting. In fact, the motivations for unintentional communicative decisions are crucial ingredients for a theory of change. The prime causal mechanism for such unintentional choices is entrenchment. There are others, such as psycholinguistic stress, which may produce speech errors, but these are not very relevant for our purposes here, as speech errors are precisely the one kind of innovation (technically speaking) that will not normally spread through the producer's idiolect or the speech community's variety. Entrenchment, though, is very important for a theory of change. An element gets selected in a Synchronic Event because it is entrenched. Likewise, an element that is entrenched stands a good chance of getting used again in the next Synchronic Event in which it would be appropriate.[6] Every Synchronic Event in which it is used will add to that element's entrenchment level, and the absence of such Synchronic Events will slowly erode its entrenchment level, cf. Keller (1990) and Croft (2000). Of all aspects of change, this one seems most amenable to psycholinguistic experimentation.

Attractiveness, and the role of Contact Linguistics

While I consider all of the matter discussed so far to be part of linguistics, the particular contribution of Contact Linguistics to the broader field would be to provide an answer to the question why we get the changes we get and not others. What makes particular elements *attractive*? Attractiveness (Johanson 2002) can be defined as the degree to which an element is likely to be borrowed as well as the degree to which an element is likely to resist replacement by a foreign equivalent. As such, it is merely a descriptive construct, to be 'read off' our data; our task as contact linguists is to figure out what determines whether a particular element is attractive or not. While all of the above is important for constructing a theory that can be empirically tested, attractiveness is the aspect that is the bread and butter of contact linguistic work, so it is also where my expertise lies. The next section will try to answer questions of attractiveness for one particular case, the compound verb in Immigrant Turkish.

In addressing the phenomenon of attractiveness, Contact Linguistics is a special subdiscipline: it has the right types of data to show what types of elements are easily taken over from other systems (idiolects as well as languages). In actual practice, then, Contact Linguistics has much in common with Labovian variational sociolinguistics: it is concerned with the description of variation, by focusing on the frequencies of variants and the determinants of their use, and on what has caused

6. Entrenchment can be seen as the cognitive result of the pragmatic maxim that in conversation we need to adhere to diachronically established conventions in order to communicate successfully.

the new variants to come into being. By extension, since change is an essential feature of language, Contact Linguistics has a lot to offer linguistics in general.

Case study: *yapmak*

The points raised in the previous section will now be illustrated with one particular on-going change in Immigrant Turkish: the grammaticalization of the verb *yapmak* 'do' into a derivational marker. There are at least three reasons for choosing this as our case study: first, there is a fairly intense debate in the contact linguistic literature about the status of verbs like *yapmak* and its equivalents in other languages, the so-called Bilingual Compound Verbs or 'do' verbs. Second, it focuses the discussion on one of the most central aspects of linguistic structure: the combination of a verb and its direct object usually denotes the core event reported in an utterance (note its centrality in most linguistic theories, and in important linguistic phenomena such as case marking, ergativity, transitivity, noun incorporation, etc.). Third, the change is complex, as it involves the interaction of a few separate changes. This interaction especially makes it suitable for illustrating the model outlined above and some of its outstanding problems.

Turkish *yapmak* is used in three different contexts. Most familiar to students of codeswitching is the combination with Dutch infinitives, yielding the standard way of borrowing foreign verbs in migrant varieties of Turkish all over Western Europe. We can call this the nativizing use of *yapmak*, and it is familiar from many other contact settings, involving many different languages. Examples were given in (2) and (3) above: crucial is that the foreign verb is in the infinitive, and that nothing can intervene between infinitive and *yap-* (i.e. no case marking, interrogative marker, plural, adverbial modifiers, etc.), compare attested (8a) with non-attested (8b-d). Interestingly, this usage is not possible in monolingual Turkish, that is: *yapmak* cannot combine with a verb, cf. (8e).

(8) a. Biz bugün *uitgaan* yap-ıyor-uz
we today go.out.INF do-PROG-1pl
'We're going out today.'

b. *Biz bugün *uitgaan* mı yap-ıyor-uz?
we today go.out.INF Q do-PROG-1pl
'We're going OUT today?' (intended reading: Focus on the infinitive, contrasting it with some other activity)

c. *Biz bugün *uitgaan*-ı yap-ıyor-uz
we today go.out.INF-ACC do-PROG-1pl
'We're doing the going out activity today.' (intended reading: we're doing an activity today, the referent of which is already active in the conversation, hence the accusative-definite marker)

d. *Biz bugün *uitgaan* filan yap-ıyor-uz
we today go.out.INF and.such do-PROG-1pl
'We're going out and stuff today.' (intended reading: we're doing a bunch of things today, including going out)

e. *Biz bugün çık-mak yap-ıyor-uz
we today go.out-INF do-PROG-1pl
'We're going out today.'

The second type of construction in which *yapmak* is used is as the transitive verb 'do' in a regular Verb-Object combination. This usage is widespread in monolingual Turkish and has survived in bilingual Turkish. While, presumably, some combinations entrenched in monolingual Turkish are lost or on their way out in Immigrant Turkish, due to the different life circumstances in which the language is used, new ones come in. This especially involves combinations with Dutch object nouns (in structures that, therefore, surface as insertional CS: a Dutch noun is inserted into a Turkish clause), and new combinations with Turkish nouns. These may or may not be loan translations (the structures are unconventional combinations when seen from the monolingual perspective, and, in case of loan translations, find their source in a Dutch combination of 'do' and the noun in question); in Myers-Scotton's (2002) terms, part of the abstract lexical structure is from Dutch). In general, the semantic contribution of *yapmak* to these combinations is slight: most combinations qualify as Light Verb Constructions. An example of a conventional Turkish unit is **yemek yap**- 'food do', "to cook", and one exhibiting codeswitching is ***Bouwkunde*** **yap**- 'Engineering do', "to study Engineering". Loan translation will be exemplified in the next section below.

The third and final type of construction that features *yapmak* is a pro-verb construction, in which it is a transitive verb, but in which the direct object is a pronoun ("I did it") or, as Turkish allows object pro-drop, absent ("I did"), cf. Ex. (9).

(9) **O-nu** ben **yap-ma-dı-m**
it-ACC I **do-NEG-PAST-1sg**
'I **didn't do that**.'

Data

The various data corpora I have used for Dutch Turkish (cf. Backus 1992, Backus 1996, and Doğruöz 2007) show the following:

a. All Dutch verbs are inserted as in (8a), in their infinitive form and followed by an inflected form of *yap*-;
b. There are many conventional uses of *yap*- as pro-verb;
c. There are many conventional combinations with *yap*- as a transitive verb;
d. There are also two ways in which *yap*- makes inroads on the domain of other transitive verbs:
   a. *Yap*- replaces its synonym *et*- in some compound verbs (roughly in about 50% of possible cases), e.g. ***kavga yap***- instead of ***kavga et***-- 'fighting do', "to fight". In terms of our model of language change, these synchronic choices have two diachronic implications:
      i. Increasing entrenchment of the schema [X *yap*-];
      ii. Decreasing entrenchment of the schema [X *et*-]
   b. *Yap*- also replaces assorted other verbs as a result of loan translations, in our data especially in the semantic field of education: e.g. ***ilkokul yaptı***- ('primary school did', "went to primary school") instead of ***ilkokul bitirdi***- ('primary school finished'), cf. Ex. (10); and ***Fransızca yap***- ('French do') instead of ***Fransızca oku***- ('French read'), cf. Ex. (11). Here, too, repeated synchronic choices cumulatively have the diachronic effects of:
      i. Increasing entrenchment of [X *yap*-]
      ii. Decreasing entrenchment of the original forms, possibly down to zero (i.e. loss from the language) in the case of [N *oku*-] in the sense of 'take a subject/class in school'.

(10) **İlkokul**-u İstanbul-da **yap-tı-m**.
Primary.school-ACC İstanbul-LOC do-PAST-1SG
'I **finished primary school** in Istanbul.'
Dutch: Ik heb de basisschool in
I have the primary.school in
İstanbul **gedaan**.
İstanbul do.PRTC
TR-Turkish: **İlkokul-u** İstanbul-da
primary.school-ACC İstanbul-LOC
bitir-di-m.
finish-PAST-1sg

(11) Ben okul-da bir sene **Fransızca yap-tı-m**.
I school-LOC one year French do-PAST-1sg
'I studied French for a year at high school.'
Dutch: Ik heb een jaar **Frans gedaan** op school.
I have a year French do-PRTC at school.
TR=Turkish: Ben okul-da bir sene **Fransızca**
I school-LOC one year French
oku-du-m.
read-PAST-1sg

Of course, corpus data only show us what occurs, not what does not. All we can say is that possible alternatives do not occur in our data, not that they couldn't occur. With the present state of our empirical knowledge, we can only say that the forms in (12) do not occur in our Immigrant Turkish data:

(12) a. ***Fransızca okudu*** ('French read'; the TR-Turkish convention)
b. ***Frans*** **yaptı** ('French did'; presumably this is an accidental gap in the data, since other Dutch names of classes do occur in this construction, e.g. ***Bouwkunde*** *yap-* 'construction engineering do')
c. **Fransızca *doen* yaptı** ('French do did'; with the whole verb-object phrase 'do French' the object of *yap-*; such combinations of Turkish object noun, Dutch infinitive verb and *yap-* do occur sometimes, but never with *doen*)
d. ***Frans doen*** **yaptı** (id.; again, such fully Dutch collocations of object noun and infinitive, followed by *yap-*, do occur, but not when the Dutch verb is *doen*)

To sum up the empirical findings, we find that *yap-* continues the uses it already had before contact, but is also caught up in some changes that have the effect of adding to the frequency with which the verb is used. This has introduced new forms to the language, both multiword units (e.g. *ilkokul yap-*) and schemas (i.e. patterns; e.g. 'educational noun' + *yap-*), and has the overall effect of increased entrenchment of the abstract schema [X + *yap-*].

All this should be seen against the backdrop of a language variety that, as far as hitherto collected and analyzed data show, is characterized by intensive codeswitching given the right constellation of interlocutors (basically, if there are no Turkish or Dutch monolinguals present), in general much lexical influence from Dutch on Turkish (in the form of codeswitches and loan translations; for the latter, see Backus & Dorleijn, 2009), and little structural interference across the board (i.e. there are unconventional expressions and word uses, but there is almost no unconventional syntax, i.e. 'ungrammatical' structures, cf. Doğruöz & Backus forthc.).

Characterizing the changes

In the remainder of this chapter, I will attempt to further characterize these findings in the light of the model of change developed in the previous sections. We first examine the combinations with Dutch infinitives, then look at the combinations with names of schools, classes and courses in which *yap-* tends to replace other verbs, and finally take a brief look at the replacement of *et-* by *yap-*.

Case study 1: Dutch infinitives + ***yapmak***

The corpus data amassed so far unequivocally show that *all* Dutch verbs that are used in Turkish clauses co-occur with *yap-*: there are no exceptions. While the example in (13a) would be like numerous attested examples in the data, none of the conceivable alternatives in (13b-f) occur (all examples are supposed to mean "Ali looked at me", and use the Dutch verb *kijken* 'look', which subcategorizes for the dative preposition *naar* 'to' in Dutch, while its Turkish equivalent *bak-*, likewise, co-occurs with a dative-marked object noun). The example in (13f) is questioned rather than starred because in other immigrant contexts, notably Denmark and some parts of Germany, *et-* is used occasionally with foreign verbs.

(13) a. Ali bana *kijk-en* yap-tı
Ali me.DAT look-INF do-PAST.3sg
'Ali *look*ed at me.'

b. *Ali bana *kijk*-tı
Ali me.DAT look-PAST.3sg
(direct inflection of the Dutch verb stem)

c. *Ali bana *kijk-en*-di
Ali me.DAT look-INF-PAST.3sg
(direct inflection of the Dutch infinitive)

d. *Ali bana *keek*
Ali me.DAT look.PAST.3sg
(finite Dutch verb)

e. *Ali bana *kijk*-le-di
Ali me.DAT look-DER-PAST.3sg
(derivational marking of Dutch verb stem, plus inflection)

f. ?Ali bana *kijk-en* et-ti
Ali me.DAT look-INF do-PAST.3sg
(bilingual compound verb, but with *et-*, not *yap-*)

Whatever the details of the diachronic development, it is clear that by now a schema has formed that is entrenched for probably every speaker of Immigrant Turkish: [DUTCH VERB + *yap*-]. I posit the abstract schema here, rather than a long list of individual multiword units that happen to share the final element, because the type frequency is very high in the data that have been examined (Backus 1992, 1996): many different Dutch verbs are used in the construction, and most likely the only limits are imposed by semantic usefulness (most of the verbs are relatively specific in meaning, in line with the general characteristic of insertional codeswitching that basic vocabulary is rarely taken from the other language, cf. Backus 2001). Whether the schema indeed has any psychological reality depends on type and token frequencies: high type and low token frequencies are ideal conditions for an abstract schema to emerge (Bybee 2006); in reality, this situation will never exist. There are always individual forms, combinations of a particular Dutch verb and *yap*- in this case, which will have high token frequency and will therefore be stored independently as fully specific multiword units. In the case of productive patterns, any corpus will at least **also** yield many combinations with low token frequencies.

If we assume for the moment that the construction [DUTCH VERB + *yap*-] is characterized by high type frequency and, for most of the individual instantiations, low token frequency, then we can characterize it as a typical productive pattern. It can further be characterized as a productive **word formation** pattern, since *yap*- doesn't seem to be doing any syntactic work: it clearly doesn't function as a transitive verb here. There is no way in which the Dutch infinitive can be construed as the direct object of *yap*-. Therefore, we can label *yap*- in this usage a derivational morpheme.

Before going into the discussion of how this change should be described, I want to draw attention to a methodological problem inherent in the above remarks. I have used the terms 'high' and 'low' for type and token frequencies as if I had solid evidence for them. I do not, however, and probably no codeswitching study does. On the basis of our corpora, we do not have any real empirical grounds on which to say that any given instantiation of the schema, say *lenen yap*- 'borrow do'; i.e. "to borrow", has high token frequency, though for this particular instantiation this is often claimed in Dutch Turkish circles (or rather by linguists familiar with the variety). Though this may very well be true, our corpora are simply too small to say anything about this issue. None of the instantiations of the pattern occur more than twice in my data. I simply think that *lenen yap*- has high token frequency in this community, and similarly for *afstuderen yap*- 'to graduate' among Dutch Turkish students, but I cannot show that without building a huge corpus of spoken Immigrant Turkish first. Questionnaires in which speakers are asked their impressions about the relative frequency of occurrence of various forms are perhaps an easier way to get some of the information we need. An additional consideration is that, as the example of *afstuderen yap-* 'to graduate', illustrates, the Dutch verbs that get used, and certainly their token frequencies, will differ from network to network (or between communities of practice), and from idiolect to idiolect. Perhaps this problem cannot be solved, and we should just learn to live with it; the only thing that our corpus does tell us is that many different Dutch verbs are used in the construction, so that type frequency can be reasonably said to be high, and, crucially, that they are **all** attracted to the construction. There is no rival pattern, and these two facts may suffice for the characterization of [DUTCH VERB + *yap-*] as a psycholinguistically real productive pattern in the derivational morphology of Immigrant Turkish.

The sketch above *describes* the change; note, however, that it doesn't *explain* how it came to be. A full analysis needs to go into this issue, since we would like the example to illuminate something about language contact more generally. Following the model outlined earlier, we should at least address the following three questions. 1) why was this schema formed? 2) how was the initial change propagated? and 3) is it a self-contained pattern or is it just one instantiation of the general pattern [X + *yap-*], which also subsumes the other uses of *yap-*?

The first question needs to be asked because a theory of language change wishes to understand why this particular change happened and not others (Weinreich, Labov & Herzog 1968). Why was attaching *yap-* to the Dutch infinitive an attractive pattern for the first Immigrant Turkish speakers who used it? The second question is related: a theory of change must not only explain why some innovations occur, but also why some are successful in spreading through the speech community, since the reasons for successful innovation and for successful propagation are not necessarily the same. These two questions are the subject of the next subsection.

The third question has to do with the right level of abstraction at which the change should be investigated. Basically, we want to know whether a speaker of Dutch Turkish sees any relation between the pattern in which *yap-* is attached to a Dutch infinitive and the one in which it does other things, specifically form a compound verb with a nominal object, or act as transitive verb in a combination with a direct object. That is: does an accurate description of this speaker's competence include one superordinate schema with subschema's, or a collection of unlinked schema's that just happen to all make use of *yap-*? We will deal with this question in the final section.

Innovation and propagation

At some point, someone produced the first instantiation of the future schema [Dutch infinitive + *yap-*], just like someone did in Germany with German infinitives, in Norway with Norwegian infinitives, and so on. At that point, this usage constituted an innovation, since the schema did not exist yet. The speaker obviously didn't have the establishment of this schema in mind; he/she simply found a need for that Dutch verb in his/her Turkish, and looked for the best way to incorporate it into the morphosyntactic frame of the utterance it was part of. The solution settled on happened to be [X + *yap*-]. Most likely, many different speakers produced the same innovation, independent of each other, and gradually the schema got established through a growing type frequency, both in and across idiolects. By the time linguists got around to study this variety of Turkish, the schema was well established.

It is likely, though, that at these initial stages, [X + *yap*-] was not the only schema tried out for this task. It is not impossible that several or all of the alternatives constructed in (13) above, were used by some speakers some of the time. Either way, [X + *yap*-] must have killed off all competition fairly quickly. Understanding why things happened that way is important, because it helps us find out how productivity is determined in language, to find out why certain constructions become popular and others don't.

Various factors, at least the six listed below, play a role, presumably all at the same time. It is important to realize that, although the specific construction with Dutch infinitives constituted an innovation when it was first produced, none of its ingredients were completely new to the system.

- Dutch words can be used in Turkish, because the lexicon is not closed off for loanwords;
- Dutch verbs encode nameworthy concepts, which will often be needed in Immigrant Turkish conversation: due to their association with Dutch culture, they often carry connotations and shades of meaning that are not carried by their Turkish translation equivalents, if such exist (cf. Backus 2001);
- The infinitive is the most accessible form of the Dutch verb for early Second Language learners of that language; the coiners of the innovation were no doubt learners;
- Infinitives are nominal expressions;
- Turkish already had the well-entrenched schema [*NOUN* + *yap*-];
- Congruence between the categories Infinitive and Noun led to the application of this schema when Dutch infinitives needed to be inserted into discourse.

At the very general level of the lexical choices that are sanctioned by the system, using Dutch words seems to have been acceptable in the community from the very beginning of the contact situation, and has continued into a situation in which virtually no Dutch element is barred, as far as speech norms are concerned, from occurring in a Turkish sentence. That does not mean, of course, that a Turkish speaker in Holland can use as much Dutch as he wants to, anytime anyplace, but the degree of freedom is completely dependent on the sociolinguistic factors that regulate register use in any communicative situation (obviously, Dutch words will not be found much in conversations with monolingual Turkish speakers, e.g. visitors from Turkey). Second, many Dutch words will actually have been very useful to even the first immigrants, many of whom never acquired Dutch to any great extent. Living in another country in which another language is spoken inevitably leads to cultural loanwords. Some of these will be verbs, verbs being content words, and content words being the logical elements any language will borrow. Given that verbs are among the words to be borrowed (to be used, that is, as insertional code-switches in everyday Turkish discourse), speakers about to use such verbs for the very first time in a Turkish clausal frame, had, in theory, various forms from which to choose. Dutch verbs, as in most languages, come in a host of inflected forms. We know that Turkish speakers settled on infinitive forms; we don't know whether there was initial competition with other forms (e.g. the verb stem, or the third person singular present tense form). We also know that these Turkish speakers, in doing that, made the same choice speakers of many other languages have made.

Three hypotheses may be advanced. The first one, which I will call the *'Infinitive First' Hypothesis*, suggests that infinitives happen to be the form most accessible to second language learners of Dutch, which the people who established the schema [Dutch infinitive + *yap*-] in Immigrant Turkish surely were. We can never know, of course, whether this is correct, as there are no data from the time, but we can certainly find out whether in new second language acquisition situations involving Dutch as the target language, this holds.[7] Further, it is likely that the Turkish schema [X + *yap*-] was attractive for use with these infinitives because the general meaning of *yap*- allows great variability of object nouns. As we saw, it combines not just with concrete nouns, but also with relatively verb-like nouns, including nominalizations, cf. (14) and (15). This makes it likely that the first immigrants perceived a high enough level of congruence between the Dutch infinitives and the X in [X + *yap*-] to warrant inserting these into the construction. Note that, while this would account for the attractiveness of the construction, it does not explain why alternatives were apparently not attractive, especially direct inflection of Dutch verb stems or insertion into the similar construction [X + *et*-].

(14) **dedikodu** **yap**-ma-yın abi-m
gossip **do**-NEG-IMP brother-my
'don't **gossip**, brother!'

7. We would need to look at Second Language Acquisition outside the classroom, as the early immigrants, temporary migrant laborers, were almost certainly not getting any formal instruction in Dutch.

(15) biz bir kere böyle bir **konuşma**
we one time like.this one **discussion**
yap-tı-k Türkler-in arasında
do-PAST-1pl Turks-GEN among
'one time we **had a discussion** like this with Turks.'

The second hypothesis, to be labeled the *'Schema First' Hypothesis*, suggests the following steps: (1) the [X + *yap*-] schema was chosen first, as the optimal way of inserting Dutch verbs (rather than, say, inflecting a Dutch verb stem directly with Turkish verb inflection), (2) the X in this schema must be a noun, and (3) the infinitive was then chosen as the most nominal form of the verb. Though not completely without merit, this hypothesis requires assumptions that are somewhat counterintuitive. The chief problem is that there is little independent reason for Step 1, for positing that [X + *yap*-] was singled out on its own strength. Also, the hypothesis presupposes quite a bit of linguistic analysis on the part of these speakers: how would they know, on the basis of what little Dutch they knew, that the infinitive was the best form to choose if a nominal form of the Dutch verb was required. If, on the other hand, it was the infinitive that presented itself first (the *Infinitive First Hypothesis*), the challenge was to find the best Turkish construction in which to incorporate it. This still requires a bit of linguistic analysis, but the task is easier: the speaker merely needs to recognize that the infinitive is rather nominal in nature, not that it's the best match for inclusion in [X + *yap*-]. Once the infinitive is chosen, and its nominal character is recognized, the choice of [X + *yap*-] as the incorporating construction becomes understandable, since formation of a compound verb consisting of *yap*- plus a process-denoting noun was a productive word formation process in the Turkish they brought with them from Turkey. All that was needed was the establishment in the speaker's minds of an equivalence between Dutch infinitives and the ordinary nouns that formed compound verbs with *yap*-. How congruence can be measured is still relatively unknown (see Myers-Scotton 2002 for some ideas). However, it must be emphasized that it's the speakers who perceived this congruence and established actual equivalence between the Dutch infinitive and the X in [X + *yap*-].

The third hypothesis is that the construction is the result of *loan translations* of Dutch idioms. This is certainly not the case. Though the construction [*doen* + Infinitive] exists in Dutch, it has a rather specific meaning, and is certainly not encountered as the normal way of using any Dutch verb, not even in the southern and eastern dialects in which it is current (most of my data are from Tilburg, which is in the South, and where a dialect is spoken in which the construction does occur). It tends to be used in questions, as in *Doe jij even afwassen?* (do you a.moment wash.up.INF; '*could you do the dishes, please?*') and render the question relatively polite.

In a sense, such questions about how changes originate are what virtually all of contact linguistics focuses on. In my opinion, it should show some more interest in how changes spread as well. To be sure, the focus on the origin of change, on innovation, is not illogical, since this is where the impact of contact is most clear. However, by casting all data in terms of synchronic decisions on the part of the speaker, we ignore the sheer force of diachronic conventionalization: current speakers of Dutch Turkish do not judge the degree of equivalence between Dutch infinitives and Turkish nouns: they simply apply the convention that a Dutch verb must be used with *yap-* and in its infinitive form.

The fact that there are no exceptions in synchronic data means that diachronic development of the schema, i.e. the propagation of the change, has produced a derivational morpheme with very broad applicability. It is in use community-wide and seems to be usable with every Dutch verb. As with all derivational morphology, we cannot always know whether, at any synchronic moment, when we come across an instantiation of the schema, what we witness is the productive use of the schema or the use of an entrenched lexical unit. Corpus data can give us some indications, but psycholinguistic evidence is needed to show what is entrenched and what is not. If we encounter ***lenen*** **yap-** 'borrow', for example, we cannot tell purely on the basis of its occurrence whether the speaker codeswitched, for the Dutch verb *lenen*, or whether he/she used the established loanword *lenen*, in its morphologically adapted form *lenen yap-*. Psycholinguistic evidence would have to be found to argue one way or another, but most likely the occurrences we find in corpora will generally reflect the selection of an established lexical unit. We tend to be aware of using a word for the first time, and this doesn't happen very often. Therefore, it is unlikely that our recording of a fairly randomly chosen spontaneous conversation of less than an hour will produce many examples of first-time use. This doesn't mean, though, that all we do in speaking is reproduce conventions. Synchronic choices may involve the selection of existing units, but these units are used in novel ways constantly, with meanings slightly different from previous uses (if only because the context is never the same), and in new combinations.

Having said that, degree of entrenchment is not beyond psycholinguistic testing. What is needed, however, is the right methodology, and the available methodology doesn't lend itself easily to use in codeswitching situations, typical as the phenomenon is of informal everyday interaction. It is hard to simulate its natural conditions in an eye-tracking experiment, for instance, let alone in neurolinguistic research. What is more, speaking is never just reproducing conventions. Synchronic choices always involve adaptation to context, to current speaker motivations, etcetera; in short, they involve construal and conceptualization. Circumstances are rarely exactly the same, except in highly ritualized exchanges.

Case study 2: Education terms

Whenever in the Dutch Turkish data a concept such as ‘I did Subject X in school’, e.g. ‘I did French in high school’, or ‘I did a class in chemistry’ is put in words, the object-verb combination used is [N *yap*-]. In the data analyzed so far, there are no exceptions. This is quite remarkable, for at least two reasons. One is that compared to conventional Turkish as spoken in Turkey, many of these expressions constitute change; the other is that while there are quite a few deviations from TR-Turkish norms in the data, there are relatively few common patterns, in the sense that a whole family of expressions utilizes a template taken over from Dutch. That is, in this case we are dealing with a borrowed construction, rather than with borrowed individual expressions only. For most putative borrowed constructions, the attested type frequency in the data is just one; but for [N (education) + *yap*-] it is more than twenty. Attested object nouns include names of subjects, e.g. French or Constructional Engineering, and names of school types, such as kindergarten or Higher Vocational Training. This makes it at least possible that an actual schema has been formed, which is entrenched alongside the many fully specific expressions that instantiate the schema. The question is why this schema has proved so attractive.

Evidently, the Dutch educational terms were inserted into a pre-existing schema [*Noun (Object)* + *yap*-], at first producing innovations, since terms like that were previously inserted into a different schema [N (education) *oku*- ‘read’]. Part of the explanation may be that such terms are very similar to nouns already found in expressions with *yap*-: the schema [N (abstract) *yap*-] was entrenched. General transitive verbs allow easy combination with many different object nouns: the role of the verb is then mostly to verbalize, in constructions often referred to as Light Verb Constructions. Verbs in such combinations tend to be general, chosen from a relatively small stock that doesn’t differ much from language to language (including such verbs as ‘do’, ‘make’, ‘give’, ‘put’, ‘see’, etc.). The more the noun refers to the intended process, the more the verb just needs to function as a verbalizer. This presumably serves an important semantic function, too, since a general verb won’t compete much with the noun for the hearer’s attention. *Yap-/Do* is the most general of all, and combines in our Turkish data with, e.g. ‘diet’, names of dishes, ‘movement’, ‘program’, ‘vacation’, ‘shopping’, ‘product’, ‘translation’, and ‘X-ray’: all names for actions, or for objects that make salient reference to an action. The same could be said to hold for the educational terms.

However, more important with respect to the explanation of the innovation is, presumably, that Dutch uses this very schema [N (education) *do*], in its Dutch guise [N (education) *doen*], to produce the equivalent meaning ‘to do a particular subject in school’. This schema has influenced Turkish usage, and the end result of propagation is the replacement of [N (education) *oku*-] by [N (education) *yap*-].

The *Loan Translation Hypothesis*, therefore, is likely to provide the best explanation for the change in this case.

This means that the question of attractiveness has to be answered differently than in the case of the compound verbs with Dutch infinitives. Since the combinations with educational nouns are isomorphic with Dutch collocations, what was attractive may have included the following: on the source side, 1) the Dutch verb-object combination of 'to do' and educational terms (facilitating loan translation), and 2) the non-availability of these combinations with 'read' in Dutch (facilitating attrition), and on the receiving side, 3) the variability of object nouns that are allowed with the very general *yap-* (facilitating extension of the pattern), as well as 4) the lack of transparency of inherited *oku-* 'read' in the inherited equivalent combinations (facilitating attrition). All these factors may have conspired to make the loan translations a likely contact outcome, but at present we don't have any data that can show how these factors are ranked in terms of importance. Current theoretical thinking about attractiveness is also not sophisticated enough to determine to what extent all four factors can be described as falling out from one general, overriding, principle, or whether they basically work independently from one another. In any case, none of these factors, except maybe the versatility of the basic schema [N + *yap-*], play a role in the change involving Dutch infinitive verbs (cf. Section 4.1).

Case study 3: replacement of ***et-*** *by* ***yap-***

The third change *yap-* is involved in is that it makes inroads on the domain of its semantic equivalent *et-*, which has been in use in Turkish for centuries as a light verb in combinations with foreign, mostly Arabic or Persian, verbal nouns. Here again, no case can be made for loan translation as a possible source, so on the source side there is nothing that can have contributed to the attractiveness of this change. The attractiveness must purely be found on the receptive side, presumably in the high entrenchment level of [N + *yap-*], and/or its more specific instantiation [Verbal Noun + *yap-*], and in the relatively low entrenchment level for [N + *et-*]. Presumably, only the individual compound verbs, such as *kavga et-*, *telefon et-*, etc. are entrenched, not the abstract schema. This, at least, is what the absence of new, productively formed compound verbs using this schema, at least on Dutch soil, seems to suggest. Note the hesitation that accompanies these interpretations. This is not accidental: direct psycholinguistic evidence for entrenchment levels is, at present, completely lacking, but could conceivably be gained through psycholinguistic tests.

Note, also, that the replacement of [N *et-*] by [N *yap-*] in some cases may be the result of increased entrenchment of the schema [Verbal Noun + *yap-*] in Immigrant Turkish. This suggests that the change is contact-induced, even if it doesn't involve any direct borrowing from Dutch. It also suggests that the schemas influence each other. The degree to which they do is the subject of the final section.

One schema or many?

One key goal of linguistics is to characterize a speaker's knowledge ('competence') and to explain how that knowledge is put to use, both in the technical sense (as studied in psycholinguistics) and in the social sense (as studied in sociolinguistics). While subfields of linguistics have happily ignored each other and have existed side-by-side for years, many phenomena really require attention from all three fields if we are to explain them fully. The phenomenon discussed in the present chapter, language change, is one such phenomenon.

Whether or not we are observing a change can only be shown by demonstrating changes in usage. Change is often merely an increase or decrease in degree of entrenchment, which can be hypothesized on the basis of usage data, but demonstrated only through psycholinguistic experimentation. If degree of entrenchment is part of linguistic knowledge, and certainly if it is all but equated with linguistic knowledge, it is obvious that linguistic theory, the enterprise of characterizing a speaker's knowledge, must have a psycholinguistic component.

In the case presented in this chapter, what needs to be explained is the change from a pre-contact system in which the schema [X *yap*-] was represented only by [N *yap*-] to a post-contact system in which it is represented by at least the following subschema's, or 'local' schema's: [N *yap*-], [Infinitive *yap*-], [N (education) *yap*-] and [Arabic/Persian Verbal Noun + *yap*-]. As discussed extensively in the previous sections, the diachronic source of all these changes is one thing that needs to be explained, and I have made various suggestions, including various expansions of the [N *yap*-] schema, and loan translation of Dutch expressions that instantiate a [N *doen*] schema. While this may constitute sufficient explanation for the addition of all Dutch infinitives, nearly all educational terms, and some Arabic/Persian verbal nouns to the inventory of forms used in the [X *yap*-] schema, discussion of sources and mechanisms of change is of little help in establishing the synchronic status of this putative schema [X *yap*-]. The question is whether a new combination, say the combination of a Dutch infinitive never used in Turkish before with *yap*- proceeds on the basis of productive usage of [X *yap*-] or of the subschema [Dutch infinitive *yap*-].

First of all, we don't seem to have any reliable methodology for investigating this question. However, we can use the following considerations to at least generate hypotheses.

The combinations with Dutch infinitives have enough distinguishing features that they may stand out as separate units: [Dutch infinitive + *yap*-] would be a separate low-level schema in that case. One reason for this separate status would be the absence of any semantic contribution of *yap*- in those cases: the meaning of the composite is identical to the meaning of the Dutch verb: *afbetalen yap*- (pay.off do) means 'to pay off', not 'to do paying off'. In addition, there are three form-based aspects that could easily be imagined to have led to the existence of the lower-level schema, and to the absence of any synchronic link with the putative overall schema [X + *yap*-]. First, since speakers are bilingual, they know that the first part of the compound has a special feature: it's from Dutch. Second, the first part of the compound always has the same ending: the Dutch infinitival suffix *-en*. Third, this construction differs from other combinations with *yap*- in that nothing ever stands between the infinitive and *yap*-: while the schema for transitive *yap*- just specifies that it co-occurs with a noun, but has no specifications as to whether the noun precedes or follows *yap*-, whether it is accompanied by other NP-internal elements, such as case markers or adjectives, nor whether any other elements (e.g. sentential adverbs) co-occur, the schema [Dutch infinitive *yap*-] is specific in this respect. All these factors may very well set the schema aside as a separate construction in the minds of speakers.

The other main group of expressions considered in this chapter may well be instantiations of a different schema, [Noun (abstract) + *yap*-]. Superficially similar to the schema just discussed, it differs from [Dutch infinitive + *yap*-] in the greater semantic contribution of the verb: while still not semantically heavy, it does contribute meaning in expressions that look a lot like Light Verb Constructions. Turkish actually makes extensive use of such constructions, also often called Complex Predicates (Haig 2002). This is likely to be an areal feature in Central Asia (perhaps itself the result of structural borrowing between the languages involved), and this may ultimately be the result of the typological fact that many languages in this area (especially Turkic and Dravidian) happen to have variable accusative marking and OV order. Generic direct objects are often not marked with accusative case, and this results in direct co-occurrence of the unmarked noun and the light verb ('made discussion'). This is the ideal breeding ground for unitization, in this case leading to the emergence of compound verbs.

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CHAPTER 13

Transfer and code-switching

Separate territories but common concerns on the border

Terence Odlin
Ohio State University

This chapter considers differences between transfer and code-switching as well as other areas of mutual concern. Differences can be seen in the data sets that would interest researchers of transfer and switching. Data sets that show the facilitating influence of one language on the acquisition of a second (i.e., positive transfer) will often be of interest to transfer but not to switching researchers. Another type of data set of greater interest to transfer researchers will be cases where an L1 word or construction is the only option available to an L2 learner – unless one made an a priori assumption that anything that counts as transfer also counts as switching; the data sets in such cases suggest a need for specifying characteristics of users and interlocutors. The chapter also focuses on the issue of constraints on transfer and switching. While some specific constraints seem possible to formulate, complications arise because of problems of definition and prediction.

Keywords: Code switching, transfer, psycholinguistics, crosslinguistic influence, constraints on transfer and code switching

Introduction

For anyone new to the subject of transfer, or for that matter, the subject of code-switching (CS), common definitions of the two phenomena might not seem to capture the difference:

> "Transfer is the influence resulting from the similarities and differences between the target language and any other language that has been previously (and perhaps imperfectly) acquired" (Odlin 1989: 27).

> "The most general definition of codeswitching is this: the use of two varieties in the same conversation." (Myers-Scotton 2006: 239)

Examples of transfer will be offered further on in this introduction, and examples of switching will appear in the next section. For the moment, though, any careful reader of the definitions might infer that what the two phenomena have in common is a mixing of languages. While this observation is true, there exist certain cases of mixing not really accounted for in either definition, and some will be considered later in this chapter. More crucially, although code-switching and transfer do constitute types of mixing, the existence of mixing itself does not shed much light on either phenomenon. However, viable distinctions between these phenomena can be offered, as will be seen, including the fact that some characteristics of mixing in transfer may go undetected without special methods, whereas switching normally involves overt contrasts between two languages or (a somewhat controversial theoretical alternative) two varieties of the same language (cf. Auer 1995, Gardner-Chloros 1995).

More than just the detection problem distinguishes transfer from switching, and this chapter will also consider another crucial distinction involving user/interlocutor characteristics. Yet along with such differences, other common concerns exist for researchers working on transfer and/or switching, and one to be examined in detail is the question of constraints. Before proceeding further with problems of differences or similarities, however, it will help to differentiate two types of transfer. The terminology for these types varies from one analysis to another, and the terms to be used here are as follows:

> *Borrowing transfer*: "In bilingual contexts, the influences found in the use of a person's native language that are due to the subsequent acquisition of another language" (Odlin 1989: 165).
> *Substrate transfer*: "In bilingual contexts, the influences found in a second language that are due to the native language" (Odlin 1989: 169).

A shorthand for substrate transfer will be L1>L2 and for borrowing transfer L2>L1, although multilingual contexts obviously involve further complications where, for instance, substrate transfer can sometimes involve L2 influence on L3 (cf. Ringbom 2007, Jarvis & Pavlenko 2008). The same language contact situation need not show a comparable degree of substrate and borrowing transfer, though it does fairly often. For instance, in the contact between Gaelic and English in the Highlands and Islands of northern Scotland, the traditional substrate language (Gaelic) affected the type of English that came to be spoken there, and even in recent times there have been bilinguals in both Scotland and Ireland whose English shows the enduring effects of substrate transfer (Sabban 1982, Filppula 1999). For instance, in Celtic varieties *after* often marks perfective aspect as in an example cited by Sabban from Hebridean English: *The stone is after going through, he says* (1982: 155), which can be paraphrased as *The stone has gone through*. This structure, known as the *after* perfect, has long been noted in the Celtic lands and continues to be used both by bilinguals and monolinguals who historically were exposed to bilingual speech (Filppula 1999, McCafferty 2004). Gaelic likewise shows innovations due to English influence, and again bilinguals in recent times show such borrowing transfer as well as substrate transfer (e.g., Dorian 1981); moreover, in current materials used to teach Gaelic, readers will find many loans from English: e.g., *poileas* (police), *fón* (phone), *staidhre* (stairway), *yacht* (yacht), and the like (Caimbbeul 1993: 33). In other contact situations, the influence seems to be more unidirectional. For instance, Schmidt (1985) reports English influence on the aboriginal language Dyirbal (thus borrowing transfer), but not much Dyirbal influence on English.

The effects of borrowing and substrate transfer normally differ somewhat, where the former typically involves considerable influence on first language (L1) lexis from L2 and sometimes on grammatical patterns but relatively little L2 influence on L1 pronunciation or morphosyntax unless the overall sociocultural influence is especially strong (Thomason & Kaufmann 1988). In the case of substrate transfer, L1 influences are typically more on L2 pronunciation and grammar although a wide variety of hypothesized constraints on such influence can be found in the literature on transfer, as will be considered later in this chapter. Despite the relative tendencies just noted, there is an overlap to some extent as in the area of calques, where an L2 expression may be patterned on L1 (as in the *after* perfect example given), or where an L2 pattern is imported into L1 (as will be seen in examples to come). Such overlaps are not surprising, given the considerable evidence that exists for the co-activation of semantic structures in two languages in many bilingual contexts (e.g., Heredia & Altarriba 2001, Kormos 2006: 59–60, 170, Marian, this volume). The co-activation of semantic or other structures in two languages no doubt figures prominently in much of what can be called *influence*, but this term in the transfer literature often includes other notions as well (and problematic aspects of the term are discussed by Odlin 2003: 436–439). In comparison with co-activation, the notion of interference is even more problematic, especially if one equates it with transfer, as discussion in the next section below will show.

The distinction between borrowing transfer and substrate transfer is reasonably clear in the Scottish contact situation as well as in many others. Even so, this distinction applies mainly to adult bilinguals, and it can blur in the case of children, such as those who immigrate to a new land before they are fully proficient in the heritage language (cf. Kim 2001, Kagan 2005). Borrowing transfer seems especially problematic since another boundary problem arises in attempts to distinguish borrowing from code-switching, as Winford (2003) and many others have noted. One reason for the difficulty of making hard-and-fast distinctions is that while some linguists cite certain patterns as cases of transfer (or as *cross-linguistic influence*, a frequent synonym), others describe very similar patterns as code-switching (or *code-mixing* or *blending*). Thus Jarvis (2002) uses "cross-linguistic influence" to describe cases such as the Finnish *putosi suoran lastovoillensa* (fell flat on her face), which is a calque on the English expression and which was employed by an adult native speaker of Finnish who has long resided in the United States. In contrast, Porte (2003) employs "code-blending" to describe the following case, which was used by a native speaker of English who had long taught English at a university in Spain: *I was really shocked when I first saw how MOLESTED some teachers got at my criticizing the system* (2003: 111–112, emphasis added). The use of 'molested' here is no doubt due to the influence of Spanish, which the teacher spoke fluently and which has a verb *molestar*, which means 'annoy.' Its status in relation to transfer and switching will be discussed further on; for now it will suffice to say that discussions of calques and cognates often appear in the CS as well as the transfer literature, and the varying terminology itself seems to reflect a number of theoretical uncertainties.

The analysis in this chapter of common concerns of transfer and switching research will not resolve all the issues inherent in such boundary problems, but a clearer understanding of the concerns is certainly a prerequisite to any successful resolution. Whatever the terms or proposed definitions of the phenomena, linguists are confronted with questions of whether to lump or to split. That is, we might opt for definitions of transfer and switching that minimize or even deny any distinction between phenomena which at least go by different names (*transfer* and *switching*). On the other hand, we might argue for differences so great between them that we assert there to be little or even no overlap. The position taken in this chapter will offer what I think are conclusive arguments against any form of lumping: to claim that any behavior identifiable as transfer is also somehow a manifestation of switching hardly seems tenable. Yet while it is relatively easy to show that the overlap of the phenomena is not total, the boundary problem of just where transfer ends and switching begins (or vice versa) is more difficult and raises problems addressed not only in this chapter but in others in the volume as well (e.g., Backus and Marian).

Contrasts in data sets

The most straightforward way to show that a real boundary exists between transfer and switching is to compare data sets that would interest CS researchers but not transfer researchers and vice versa. Before looking at transfer data, it is necessary to consider some elementary examples of switching. The first comes from a conversation analyzed by Myers-Scotton (1993: 41) in which a man in Nairobi first uses Swahili and then English with a vegetable seller:

> Mboga gain? Nipe kabeji hizi. *How much is it?*
> 'Which vegetables? Give me those cabbages. How much is it?"

In this example, the first two sentences contrast linguistically with the third, and such switching often goes by the term *inter-sentential*. Other contrasts can occur within sentences, as in an example given by Heath (1989: 34) of a French noun phrase embedded in a Moroccan Arabic sentence:

> kayn-in lli sakn-in f-les villas
> there are which living (PL) in the villas
> There are some (people) living in the villas (nice homes).

In this instance of *intra-sentential* switching, the French NP is embedded in a prepositional phrase headed by an Arabic form (*f*-). Sometimes the embedding involves more than just a phrasal constituent yet still does not qualify as inter-sentential switching. Heath cites a French clause preceded by an Arabic conjunction (1989: 39):

> ili?ima c'est une ville économique
> because it's a city economic
> because it's a commercial city

Although the distinction between inter- and intra-sentential switching is frequently cited in the CS literature, the boundary issues between intra-sentential switching and borrowing transfer are often problematic, largely because frequent switching may be a basis for words or larger constituents becoming integrated into the so-called matrix language (e.g., Arabic in the examples from Heath). For Myers-Scotton 1998: 290), the key characteristic of CS phenomena is morphological contrast: "'Classic' intra-sentential code-switching is defined as the use of morphemes from two or more linguistic varieties in the same CP" [Complementizer Projection], this latter phrase being a term in generative linguistics more or less equivalent to any clause, main or subordinate. More significant than the generative assumptions she adopts is, however, her assertion that contrasting morphemes of two different languages and dialects are necessary.

The preceding examples offer some important clues that will aid in refuting any conception of switching that lumps it with transfer (and it should be said that the definition of Myers-Scotton does avoid that mistake). First, all three examples involve overt contrasts between languages, something that can be taken, as it is taken by Myers-Sctton, as an essential fact about switching but *not* about transfer. Second, the examples come, as do most examples of switching, from encounters between bilinguals and multilingual individuals fluent in at least two languages; when proficiency is relatively high in two or more languages, the data sets will often be just as interesting to CS researchers as any data from less proficient individuals but the former group will produce less data of interest to researchers of second language acquisition (SLA). On the other hand, there are also data sets of special interest to SLA researchers that have little if anything to offer CS specialists, as will now be considered.

Positive transfer

In one sense what can count as evidence of transfer encompasses a wider range of behaviors than is the case with switching. With the latter, an overt contrast between two varieties seems crucial, as in the examples just given. The contrast may be only phonetic (if we accept that dialect switching is a form of code-switching), or it may involve differences in lexis or morphosyntax. With transfer, on the other hand, much of the evidence of the phenomenon may remain invisible without special methods to identify it. This may seem surprising if one equates transfer with interference (or, to use a roughly equivalent term, *negative transfer*). However, Ringbom (2007) and others have cogently argued that positive transfer (i.e., facilitating L1 influences) plays a greater role in second language acquisition at least when the native and target language are closely related. The following example, written by a native speaker of Swedish with about two years of English study, illustrates the importance of positive transfer:

> It's about a girl thats alone and hungry.
> She's walking down the street and she's wery hungry.
> Suddenly she comes to an bakery.
> And she's so hungry that she steals a loaf.
> But a women was watching, so when the baker comes out again she says that a girl took a loaf.
> The girl is running but she bumps into Charlie.
> The police catches the girl and she is explaining that she was so hungry.
> But then Charlie stands forward and says "She didn't take the loaf I took it!".
> The police walks away with him and the girl is relesed.
> But the women says to the baker "that man didn't take the bread the girl did it".

Several errors are evident in this passage, which comes from narrations of scenes in a Charlie Chaplin film that were collected by Jarvis (1998), and some errors are arguably due to direct or indirect negative transfer (i.e., interference) from Swedish, as in the NP *an bakery*, where the use of *an* instead of *a* probably shows the influence of the Swedish indefinite article *en*. However, what is far more significant in this passage is the generally successful use of articles. Like English, Swedish has both indefinite and definite articles, and while some important differences exist in their article systems, the importance of articles in both languages is great, with an accordingly large potential for positive transfer. Yet just citing the passage by itself does not verify such transfer, nor does just noting the cross-linguistic resemblances between Swedish and English. After all, one might argue that the success comes simply from the student's own efforts to understand the new article system, efforts that speakers of any language – with or without articles – might also make.

To demonstrate the facilitating effects of the Swedish article system, it is necessary to compare how others perform on the same task when they do not have a native language with an article system. Finnish is just such a language (despite claims to the contrary about a supposed article in the language, as discussed by Jarvis 2002: 405). The following sample collected by Jarvis comes from a speaker of Finnish who had likewise studied English for about two years:

> Girl wolking the street.
> She is very hungry and lonely.
> She see to bread and she take it.
> Girl run and hit a Charlie Chaplin.
> Old woman see the girl and bread.
> Policeman take a girl, but Charlie said: Girl didn't – I did.
> Policeman take Charlie and go away.
> Old woman say to baker: Girl take it, not man

Although the writer here succeeds in a few cases in using articles in a target-like way, the zero articles (as in the bare NP *Girl* in the first line) and other errors with articles show this learner to have very little control of the target language system. Certainly a comparison of just one speaker of Swedish and one speaker of Finnish does not allow by itself a strong reason to infer what larger populations will do. However, Jarvis (2002) analyzed large samples, 199 English narratives written by native speakers of Finnish and 145 by native speakers of Swedish, as well as comparable narratives written in the native languages. His analysis shows that the passages above do in fact illustrate the general pattern: i.e., Swedish speakers had a much easier time with English articles than did Finnish speakers.

The two passages given here illustrate the importance of the need for looking at different groups of learners on the same task to establish positive transfer. Although a comparative method is not always needed to demonstrate negative transfer (Odlin 2003: 450), it can help in establishing some cases of interference, and it is indispensable for cases of positive transfer involving structures such as articles (cf. Jarvis 2000). Few if any cases of switching require such a methodology; in this sense, then, the scope of transfer is wider than switching. The accurate uses of articles seen in the narrative of the Swedish student help build a case for positive transfer yet they seem a most unlikely data set for a CS study. For a switch to make a communicative impact, a contrast has to exist, whereas the effects of positive transfer remain invisible without special methods.

User and interlocutor characteristics

The examples just discussed show that it would be mistaken to equate transfer with interference; transfer can be either negative or positive, and in the latter case it scarcely resembles the phenomena associated with switching, at least the phenomena as defined by Myers-Scotton. Accordingly, any conception of switching and transfer that simply lumps them together seems doomed to failure. Along with considering the importance of positive transfer in some data sets, it also seems necessary to link characteristics of language users and/or interlocutors to any data set used in the study of transfer, switching as well as other forms of mixing. Such characteristics are of course necessary for understanding the data sets themselves but additionally offer reasons to eschew lumping. One user characteristic of the next data set further demonstrates the need to distinguish a particular form of mixing from either transfer or switching:

> Mehr books (More books)
> Guck, alle Auto on the ship (Look, all the auto on the ship)
> With the cars rauf (With the cars on top)

At first glance, these examples might seem to be instances of either switching or negative transfer. Yet although they come from a study of children in a German/English environment, the analysis of Redlinger and Park (1980) concludes that the children are not bilingual since they have not yet developed a clear sense of two distinct languages being spoken in the environment. Thus, the data set here argues for a distinction between two types of mixing, one where individuals lack the metalinguistic awareness of language differences and one where they have such awareness, a.k.a. declarative knowledge. While this set shows examples of mixing, one knowledge characteristic of the users makes it inadvisable to interpret as an illustration of either transfer or switching.

A corollary of the preceding conclusion is that at least one user characteristic (declarative knowledge) must be considered as an integral part of any data set. Indeed, still another knowledge characteristic of users can prove helpful in making distinctions, as seen in an example of some attempts at French of a Spanish-speaking woman called Berta, an immigrant in France (Giacobbe 1992: 241):

2) **y* elle la femme *con* avec Chaplin *arrancaron no sé como se dice** [a]/**por* la rue*
Sp.: *And* Fr: *the woman* Sp: *with* Fr: *with Chaplin* Sp: *tore off I don't know how to say* [a]/ Sp.: *through* Fr: *the street*

Giacobbe uses asterisks to mark Spanish words that interlace Berta's French. In contrast to the children in the Redlinger and Park study, Berta shows clear awareness of two different languages, as her word search for a French equivalent of Spanish *por* shows. Moreover, she seems to be using her L1 as a default as in the use of *arrancaron* (tore off), which thus can be seen as a case of negative lexical transfer since French does not have the verb *arrancar*. (While she lacks such procedural knowledge, Berta can nevertheless use the definite feminine singular article *la*, which is a French/Spanish cognate.) In cases where an L1 word or construction is the only option available to a language learner, it would be implausible to consider such a use as switching as well as transfer; otherwise, the procedural knowledge of highly fluent bilinguals is lumped together with that of incipient bilinguals. The products of negative transfer as in Berta's speech may resemble the products of some switching, but the same could be said, of course, for the mixing in the German/English examples of Redlinger and Park. Berta's apparent lack of knowledge about how to say what she wants to say in French is thus a user characteristic that should be linked to the data set of her utterances. The above example here thus qualifies as data relevant only to a study of substrate transfer.

Giaccobe does not specify the exact language background of the individual to whom Berta recounted the *Modern Times* episode, only saying that the person was another L2 user of French. When interlocutors have the same languages, it can become harder to distinguish the mixing associated with switching and the mixing associated with transfer since either language chosen will be intelligible to the speaker and listener. Such is the case in the Swahili-English example of Myers-Scotton given above, where the vegetable seller and the customer knew both languages. Even so, if Berta does not know the French equivalent for *arrancaron* or *por*, she can hardly be said to be alternating codes – the only alternative is her native language. Moreover, when there is only one language in common (e.g., if Berta is using French with a native speaker of Arabic unfamiliar with Spanish), there is certainly an opportunity for transfer but not for switching. The assumption being made here is that in CS behavior the alternating to either language has a communicative function, which seems indispensable for any analysis of bilingualism. Berta's apparent inability to find the appropriate French words suggests the highly limited knowledge of an L2 user falling back on her L1 rather than the drawing on alternative resources available to a bilingual who switches languages with interlocutors having similar linguistic resources.

User characteristics certainly matter to understand any kind of language use. Thus in the earlier comparison of an L1 Swedish and an L1 Finnish user of English, their native languages were a crucial characteristic. Even so, the writing task they engaged in did not have a clear-cut audience (though of course many kinds of writing do). In contrast, Berta had a specific interlocutor (albeit one whose identity was not fully specified). In the Scandinavian situation it would be hard to characterize the data sets in terms of the audience whereas with Berta's speech such a characterization is possible. In cases where there is both an identifiable speaker/writer and an identifiable audience/interlocutor, it is best to consider interlocutors as well as users as relevant to the data set for any analysis of transfer, switching, or other phenomena.

The background of interlocutors can serve as a criterion to distinguish the data sets for transfer from different kinds of language mixing in another contact situation as well. Winford (this volume) discusses the case of Media Lengua, a mixed language spoken in Ecuador and in other Andean nations, and emphasizes the similarity between switching and the mixture of Quechua and Spanish in Media Lengua. In Winford's analysis, Media Lengua involves lexical insertion patterns similar to those found in switching, and such a parallelism may prove significant for understanding the origins of Media Lengua (cf. Muysken 1997). In any case, it also significant that Muysken does *not* equate the Quechua-influenced Spanish common in the region with Media Lengua:

> Clearly, Media Lengua is very different from this type of Quechua-Spanish interlanguage. The interlanguage lacks Quechua morphology and elaborate syntax characteristic of Media Lengua, and it is characterized by a paratactic system of phrase formation and a very rudimentary form of Spanish morphology.. (1997: 407)

The examples that Muysken provides certainly support this conclusion, but one qualification should be noted: namely, Muysken's focus here seems to be restricted to the kind of L2 Spanish produced by incipient bilinguals, i.e., Quechua speakers at the low end of a Spanish proficiency scale. In another study (Muysken 1984) he compares the Spanish of fourteen individuals at different levels of proficiency, and he sees a clear social stratification with lower class speakers showing more Quechua-influenced features, especially in word order patterns associated with the SOV typology of Quechua. Those somewhat higher on the social scale in his study were also bilingual but more fluent, whereas those highest on the scale were monolingual in Spanish and showed relatively few Quechua-influenced features.

Muysken's insistence that Spanish interlanguage and Media Lengua are different in kind is consistent with the difference of social milieus where these languages can be used. In the case of Media Lengua considerable proficiency in Quechua seems necessary for interlocutors who seek to participate fully in a conversation. In the case of Andean Spanish, interlocutors can be either monolingual or bilingual, and the degree of Quechua influence is not necessarily pegged to whether or not the interlocutor knows that language; thus, a bilingual can use a form of Spanish showing considerable transfer with a monolingual unable to use either Quechua or Media Lengua. Any strong-standing historical relation between the use of Quechua-Spanish code-switching and the rise of Media Lengua is consistent with but also distinct from an equally long tradition of use of a colonial Spanish in the Andes. Accordingly, the data sets of switching and Media Lengua may well be very similar, as Winford suggests, but they are different from the transfer-affected data sets of colonial Spanish because of differences of both users and interlocutors.

While it may be true that Media Lengua owes its status as a mixed language to a long tradition of CS patterns that became entrenched among bilingual interlocutors, there is another common diachronic outcome of bilingualism in other social contexts: attrition, where the native language undergoes a permanent change and where there might not be any intermediary language such as Media Lengua. Thomason and Kaufmann (1988) discuss a variety of cases such as Cypriot Arabic (influenced heavily by Greek) and Asia Minor Greek (influenced heavily by Turkish) which show fairly radical divergences from the wider Arabic- and Greek-speaking worlds. In the next section, one of the observations in the source that Thomason and Kaufmann used for their analysis of Cypriot Greek (Newton 1964) will be discussed.

In cases where the populations are very small and heavily influenced by a dominant culture, the linguistic attrition may be even greater and be one sign, among others, of an imminent language extinction. Such is the case of Cornish, which has long been extinct in Britain (Thomas 1992), but other Celtic languages and indeed many more languages face such similarly grim prospects (e.g., Dorian 1981, Schmidt 1985, Grenoble & Whaley 1998). Yet far short of such outcomes as in Cypriot Arabic or Cornish, attrition also can be found in social circles where the eventualities are not extreme. For instance, the university English teachers studied by Porte (2003) do not show much attrition even while they show some, as in the case already noted: *I was really shocked when I first saw how molested some teachers got at my criticizing the system*. Porte stresses the importance of interlocutors in the social setting where this and some similar cases appeared: the participants in the conversation were all university instructors, native speakers of English, and long-term residents of Spain fluent in Spanish. He speculates that with native-speaker interlocutors belonging to other groups (e.g., English tourists), these teachers might be more concerned with native-speaker norms, and this seems especially likely given the fact that the subjects in his study were teachers of English. Thus people

> in the same closed speech community may feel at liberty to use such 'tolerated' deviance [e.g., *feel molested*] on the assumption that the interpersonal communication may thereby be enhanced or facilitated. With the outsider however, our same subject may feel that this 'authority' is missing and may attempt to maximize alignment on remembered norms by consciously reducing any deviant features to a minimum. (2003: 118)

As Porte suggests, attrition in such cases could then be seen to be less advanced. If so, it would also be true that the data sets would be different, with the differences being a function of the difference of interlocutors.

As noted above, Porte refers to cases such as *how molested some teachers got* as "code-blending." If the individual who used this was unable to employ the norms outside the closed community (e.g., *feel annoyed*), such so-called blending would be better viewed as the kind of L2>L1 transfer that ultimately results in attrition. If, however, the individual could employ such norms, the example would best be considered as a kind of transfer akin to switching, what Myers-Scotton (1998) calls "convergence," as discussed in the next section. In these two different outcomes, the psycholinguistic mechanisms leading to the switch/transfer are likely similar if not the same, but the psycholinguistic and social outcomes are quite different. Thus, data sets where interlocutors as well as speakers are taken into account can help demarcate the transfer/switching boundary.

Constraints: Definitions and predictions

Apart from the problem of establishing differences between transfer and switching, another common concern for researchers is the issue of constraints. In both fields linguists have long posited constraints, and in both fields there have been those who have questioned the success of specific constraints (cf. Thomason & Kaufmann 1988, Winford, this volume) and some have even wondered whether an approach using constraints is viable at all (cf. Cantone & MacSwan, this volume). Any attempt to identify constraints on switching that also hold true for transfer obviously must offer generalizations equally valid for both. The following analysis indicates at least one plausible basis for positing constraints, in relation to the issue of bidirectional transfer, which also seems relevant for CS analyses; even so, the discussion will also suggest a need for skepticism about some other recent claims in SLA research about constraints on transfer.

Defining any constraint itself can often be problematic, as with the oft-claimed constraint on the transfer of morphology (e.g., Dulay et al. 1982). The phrase *constraint on morphological transfer* can imply very diverse phenomena; Jarvis & Odlin (2000: 537–539) note several possible meanings. Although not all proposed constraints may entail multiple ambiguities, any proposal warrants close scrutiny for exactly what it claims.

Aside from questions of specific definitions, there is also the underlying question of just what a "constraint on transfer" actually is. It certainly entails a limiting condition or conditions on when a phenomenon will or will not occur. Accordingly, any constraint is tantamount to a prediction. For those familiar with the history of contrastive analysis, the word *prediction* may set off a warning bell. About forty years ago there began a period of skepticism about whether contrastive analysts could make reliable predictions about transfer. Since the 1980's the skepticism has ebbed, but the theoretical problem of predictions remains, often couched in the term *transferability* (e.g., Kellerman 1995). In the heyday of revisionist thinking, many linguists accepted the distinction that Wardhaugh (1970) made between a priori and a posteriori contrastive analyses. The latter according to Wardhaugh could offer plausible evidence of transfer, but a priori predictions could not, he thought, hold up in empirical investigations. For all its cogency, however, Wardhaugh's distinction oversimplifies the prediction problem. It is possible not only to verify the occurrence of transfer through a posteriori methods: with a review of multiple studies, some predictions not so different from a priori ones can successfully foresee a case of transfer never before documented. The clearest potential of such predictions involves several studies of the transfer of articles (references appear in Odlin 2006). Indeed, the success that Swedish speakers (in contrast to Finnish speakers) have with English articles, as detailed earlier in the chapter, constitutes one example of a posteriori analysis providing some of the evidence which warrants predictions about other cases of positive transfer of article systems, i.e., with other native and target languages such as L1 Swedish and L2 Rumanian (a language contact situation that has not, to my knowledge, been studied with regard to the question of article transfer). Although the largest number of studies that warrant this type of prediction involves articles, there is also reason to believe that further work on other structures such as serial verbs will warrant equally viable predictions (e.g., Helms Park 2003).

If linguists can, after all, make viable contrastive predictions, such success also augurs well for further attempts at trying to posit constraints on substrate transfer. Nevertheless, the list of truly plausible constraints remains short: predicting when transfer will not occur seems no easier than predicting when it will. Various researchers have posited constraints on the transfer of basic word order (e.g., Rutherford 1983), of bound morphology (e.g., Eubank et al. 1997), of opaque idioms

(Kellerman 1977), and of other structures, but while some studies do indeed find little evidence of transfer of such structures, other studies have documented actual cases (references are given in Odlin 2003, 2006). The challenge for formulating an accurate constraint resides very much in the need to specify the particular conditions. In the case of idioms, for example, the evidence does suggest that under some circumstances learners may feel cautious or downright suspicious about the transferability of particular L1 idioms, but work on contact varieties of English shows that in situations outside of classrooms, bilinguals do transfer opaque idioms (cf. Kellerman 1977, Odlin 1991). Even in classroom settings, individual learners can have different perceptions of the transferability of idioms (Cieslicka 2006). As with predictions of the occurrence of transfer, predictions of non-occurrence must take individual variation into account.

The issues of constraints on transfer are also relevant to the problem of constraints on switching, most notably because of the special problem of bidirectional transfer (i.e., L2>L1 along with L1>L2). Pavlenko & Jarvis (2002) considered several cases, with one of their primary goals being to identify structures susceptible to both types of transfer. They found such bidirectionality in some areas (e.g., semantic extensions) but either no transfer or only one type – borrowing or substrate – in other areas (e.g., articles, which showed only L1>L2 transfer). This comparative approach is worthwhile, as is evident in the finding about semantic extensions, as when Russians speaking English say *empty bench* to describe a vacant bench, with their adjective choice constituting a sense extension compatible with a Russian adjective. This example of an L1>L2 calque has many counterparts in L2>L1 transfer where, for instance, the Finnish motion verb *menee* (goes) is used in the following collocation of a bilingual (2003: 89):

> Mihin tämä menee?
> Where this-NOM goes
> Where does this go?

This collocation calqued on English differs from any normative choices in Finnish, e.g.,

> Mihin panan tämän?
> Where put-1SG this – ACC
> Where do I put his?

As with the interlocutors in the Porte study, the interlocutors were bilingual adults, though of course Finnish/English in this case as in the example cited earlier *putosi suoran lastovoillensa* (fell flat on her face). Such instances might seem to raise the possibility of what switching researchers call "matrix language turnover" (e.g., Myers-Scotton 1998), but reasons for ruling out such an analysis will be given further on.

While Pavlenko and Jarvis thus found no constraint on calquing (and thus found bidirectional transfer), they did find a unidirectional pattern for articles. That is, the difficulties that Russian and Finnish speakers have with articles in L2 English seem attributable to substrate transfer, but no effect of L2 English articles was evident in either their L1 Russian or L1 Finnish data. On the other hand, it would be wrong to infer that articles never surface in CS data. Indeed, the Russian/English switches in the Broersma et al. study (this volume) shows instances: e.g.,

> .. *kogda oni cherez Italiju ehali* / and had such a horrible time / to adjust here……[….when they go through Italy and had...]….

The CS literature in fact shows no shortage of comparable examples such as one from Heath (1989) cited earlier, *iliʔima c'est une ville économique* (because it's a commercial city), where an article from the embedded language (the French indefinite *une*) is embedded in the matrix language (Arabic). In switches where Finnish is the matrix and English the embedded language, articles sometimes appear in islands, as in an example from a detailed study of CS patterns by Halmari (1997: 45): *It's only a hot dog muta se maistuu rasvasemmalta kun oikee hoddari* (It's only a hot dog, but it tastes greasier than a real hot dog). However, there seems to be little if any evidence that articles become loanwords as productively used as, for example, nouns, verbs, or other so-called content morphemes. It seems highly unlikely that a bilingual would produce the following variant of an earlier example:

> * Mihin the kirja menee?
> Where the book-NOM goes
> Where does the book go?

While another variant, *Mihin tämä kirja menee*? ("Where does this book go?"), does seem plausible, the isolated occurrence of the English article in what is otherwise a Finnish sentence (*Mihin the kirja menee*) seems highly unlikely, and there are in fact no examples at all in the many CS examples cited by Halmari. Such an absence is consistent with the system morpheme principle of Myers-Scotton, which holds that all grammatically relevant inflections and function words come from the matrix language (1993: 125), which would automatically exclude isolated articles as in the above example. The apparent constraint on articles is much less general than the principle proposed by Myers-Scotton, of course. Yet while it thus applies to fewer phenomena, it does appear easy to confirm from observable data. Furthermore, the apparent constraint on transfer seems closely akin to a likely CS constraint: when only one language has articles, the embedding of a lone article seems most improbable.

The word *improbable* just used serves better than *impossible*, and such a similar scalar notion of constraints is in fact used by Kootstra et al. (this volume). An instance of L1>L2 transfer offers a cautionary example. In the data collected by Jarvis (1998), one Finnish speaker wrote *Charlie Chaplin get up and say shelle* [to her]: "*Remember my – and bread*." The form *shelle* combines a Finnish allative case inflection used with the English pronoun *she*. Such an example squarely contradicts any notion of constraints that assumes an all-or-nothing outcome, i.e., any absolute constraint posited on the transfer of bound morphology. Nevertheless, such instances were extremely rare in the data Jarvis collected even though there was other evidence of morphological transfer (e.g., the semantics governing certain L2 English prepositional choices). If constraints are tantamount to predictions, as argued above, the probabilistic approach still remains superior, where some transfer or switching outcomes will seem more likely than others.

The cases of non-transferability of articles just discussed might prove to be one demarcation point to distinguish switches from borrowing transfer, where articles could appear in CS islands but not as integrated loan words (or thus as routine borrowing transfer). However, caution is advisable. It might go without saying that any findings supporting either bidirectional or unidirectional transfer are subject to the language-specific facts of the particular bilingualism studied, and there is at least one case in the literature where a pairing suggests diachronic L2>L1 influence in the area of articles. In a brief description of Cypriot Arabic, Newton (1964: 47) observes that the Arabic article in this dialect closely resembles its use in Cypriot Greek, although he gives few details. It would thus seem that the exposure of Arabic speakers to L2 Greek has led to a mild form of borrowing transfer. What makes the Cypriot Arabic case different from the Russian and Finnish ones is probably the prior existence of a definite article in both Greek and Arabic, thus also a syntactic category that existed independently of any contact between the two languages. "Transfer to somewhere," an expression coined by Andersen (1983), seems appropriate here, even though he discussed this principle mainly in cases of L1>L2 influence instead of the reverse. Nevertheless, the existence of articles in both Arabic and Greek preempts what may be a real constraint on borrowing transfer when only the L2 has articles.

The Cypriot Arabic example may also offer some insight into the relation between CS patterns of article use and the development of languages showing "replacement of large portions of the inherited grammar," to use the rubric of Thomason and Kaufmann (1988: 100). From several examples of this variety given by Newton, the degree of mixing suggests the possibility of what Myers-Scotton (1998) and others have termed "matrix-language turnover," where one language is superseded by another as the usual matrix language in switches. An investigation of articles and grammatical gender in German (Fuller & Lehnert 2000) found that

German/English bilinguals for whom the former was the dominant language (and the matrix in their switches) differed in how they used German articles from another group whose CS patterns showed English to be the matrix language (although it may be questioned whether the notion of a complete turnover is applicable in such a case, as will be discussed below). Whatever its real extent, the turnover of matrix language for the latter group apparently resulted from their much longer residence in the United States, and the German article choices of this group showed more influence from English. Neither group differed much, however, in gender assignments in noun phrases, and the authors see this as due to the typological difference between German, a language with grammatical gender, and English a language without it. If the analysis of Fuller & Lehnert is applicable to Cypriot Arabic example, the parallelism would be where Greek may have become the matrix language in switches and thus a likely influence over several generations in any diachronic shift away from more common patterns of article usage in Arabic toward a Hellenic pattern.

The notion of matrix language turnover thus seems promising, but its applicability no doubt varies according to situation, and Myers-Scotton herself sees turnover as a matter of degrees (1998: 300–301). The CS patterns of the Fuller & Lehnert study show varying degrees of English influence, but the German of the longer-term residents does not show nearly as much attrition as does, for instance, Cypriot Arabic. Moreover, the applicability of a turnover analysis is at best limited, when the phenomena under study are calques or cases such as the Spanish influence on the semantic extension of *molested* in the example from Porte (2003); for Myers-Scotton such examples do not involve CS but rather "convergences," which she defines as "the use of morphemes coming from a single linguistic variety but with parts of other lexical structure coming from another source" (1998: 290). For Myers-Scotton, complete turnover is possible only when actual switching occurs (1998: 314), and so "convergence" will not suffice.

There thus seems to be no serious argument for a complete turnover in cases such as the L2 English influence on L1 Finnish in *Mihin tämä menee?* (Where does this go?). Such instances show no more contrast of morphemes than do the English papers written by Finnish and Swedish speakers already cited. The English-influenced Finnish would obviously not be understood by any monolingual speaker of English, and yet monolingual Finns consulted by Jarvis (2003) did understand many of the calques he presented them for their judgments. It should be stressed that Myers-Scotton does not favor such an analysis of complete turnover. The fact that she distinguishes CS phenomena from convergence phenomena suggests that the latter do not involve switching but do involve L2>L1 transfer albeit with a different term.

Pavlenko and Jarvis were careful to restrict their analysis of possible constraints to specific pairings of languages, and the specific unidirectional constraint discussed in this section, on articles seems to be valid for predicting both transfer and switching behaviors. That is, when the L1 lacks articles, isolated L2 articles are unlikely to appear in a switch where every other morpheme comes from L1, and likewise, calques of L2 articles are unlikely to appear in L1 (and whether such a hypothetical appearance might be called a convergence or transfer seems a minor terminological issue). Beyond such specific predictions, however, the literature on constraints on transfer seems to offer little help in developing predictions viable both for transfer and switching. Two recent models of bilingual processing (MacWhinney 2005, Pienemann et al. 2005) have attempted more general accounts of constraints and transferability, but neither approach is very satisfactory. In his 2005 formulation as well as in some earlier work on what he terms the Competition Model, MacWhinney argues that "[the] basic claim is that whatever can transfer will" (55). While it would appear that he considers everything to be transferable, his actual analysis is far more conservative. Most remarkably, he deems it a "fact that morphosyntax is not subject to transfer" (59). In making this claim, MacWhinney cites grammatical gender as an example of non-transferability. Yet there does in fact exist a highly detailed study not cited by MacWhinney (Sabourin 2001) whose results point to a strong advantage for speakers of German in the acquisition of grammatical gender in Dutch. This advantage is quite clear since Sabourin compared the Germans' performance with that of speakers of languages with grammatical gender yet less like the Dutch system (e.g., French); furthermore, these speakers showed an advantage over speakers of English, which of course lacks grammatical gender. Accordingly, MacWhinney's example works against his own claim. Apart from Sabourin's study of gender, an enormous amount of credible research likewise points to many sorts of morphosyntactic transfer, as with the studies of articles alluded to already and the studies refuting proposed constraints on word order and morphology reviewed by Odlin (2003, 2006) and by Jarvis & Pavlenko (2008).

In elaborating their own "Processability Theory," Pienemann et al. (2005) interpret MacWhinney's position that "whatever can transfer will" as similar to the Universal Grammar analysis of Schwartz & Sprouse (1996) known as Full Transfer/Full access. Some other assertions of MacWhinney also do suggest such a resemblance, as in his claim about "transferring the L1 conceptual world en masse to L2" (2005: 56–57, cf Odlin 2008). Nevertheless, Pienemann et al. overlook the skepticism shown by MacWhinney about morphosyntactic transfer and in fact, their own theory of constraints is less restrictive than the Competition Model. They posit a processing hierarchy in which the conditions for transfer do not obtain at higher levels unless learners have first acquired particular structures at lower levels. In morphosyntax the stages of the hierarchy from easier to more difficult are (a) "words," (b) "diacritic" specifications such as tense marking, (c) rules within a phrase such as number agreement, (d) rules linking phrases, and (e) rules linking clauses. Unfortunately, the actual predictions that their hierarchy generates are contradicted by some empirical work. For instance, claims they make about the non-transferability of word order by incipient bilinguals have not held up when closely examined (e.g., Bohnacker 2005), and similar problems are evident in the actual outcomes – ass opposed to those predicted by PT – for the development of subordination in comparison with article systems (Odlin et al. 2008). Thus, while very specific constraints show promise of being viable predictions for both transfer and switching (such as those for articles), more general frameworks such as PT and the Competition Model have yet to show much promise.

Conclusion

Before some final reflections, a summary will be useful. The distinct realities of transfer and switching were affirmed early in this chapter with a look at the difference of data sets of interest to transfer and CS researchers. Much of the evidence of positive transfer will not show any cross-linguistic contrast of morphemes, the kind of mixing normally seen in CS patterns. When certain data sets are linked with characteristics of users and/or interlocutors, it can also be a straightforward matter to distinguish relevant data sets, as in a contact situation in the Andes. Partly because of the similarities of interlocutors and users of Media Lengua and of CS patterns in Spanish and Quechua, Media Lengua will mainly interest CS researchers, whereas the interlanguage Spanish of Quechua speakers will primarily interest transfer researchers. Along with these contrasts between transfer and switching, another common concern examined has been issue of constraints. Analysts must confront problems of definition and prediction, especially since constraints can be viewed as a type of prediction. While the theories of constraints on transfer proposed in the Competition Model and Processability Theory have serious shortcomings, some more specific predictions and constraints on transfer and switching do seem possible, with what happens to articles being the example considered in some detail.

Unfortunately, several interesting problems are beyond the scope of this chapter, e.g., pragmatic dimensions of switching and transfer. Even so, a little more attention to one boundary problem considered above seems warranted. As just noted, distinguishing transfer from switching will not always prove easy, partly because of the fact that the phenomena have overlapping characteristics such as the co-activation of structures in two languages. However, an analogy from diplomacy can help clarify the scale of the difficulty. The boundary between two nations may be problematic, but diplomats from the two states may nevertheless acknowledge (at least in some political contexts) the real existence of two distinct countries. Likewise, the boundary problem with transfer and switching should not cause researchers to lose sight of very real differences between the two phenomena, as the contrasts considered in the chapter show. Detailed analysis is obviously needed, yet even though the border may seem especially convoluted when viewed through a good microscope, vastly different territories lie on either side of the boundary.

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