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Two speakers, one dialogue

An interactive alignment perspective on code-switching in bilingual speakers

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Abstract

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 and the 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.

Two speakers, one dialogue

An interactive alignment perspective on code-switching in bilingual speakers

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 (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, in press; 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 exclusively 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 and 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 dialogue 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 2008; see also Garrod & Pickering 2007).

[Figure 1 about here]

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 and 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 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, 2008). 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.

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 also 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) found instances of code-switching that were influenced by the situation too: 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). 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). In this study, 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 in word orders that are language-specific is more difficult 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 thoughts 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 *dokter*"). 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 will be 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 overlap and language-specificity lead 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, then, 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 (i.e., 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 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 above. 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.

Methodological aspects

The interactive alignment model is not only theoretically appealing; it also offers interesting possibilities to combine research questions and methodologies 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., in press; Myers-Scotton 2006).

Both Gullberg et al. (in press) 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).

The question is, however, whether this example-based approach can be treated as counter-evidence. 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 role of 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 prime 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 reading 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: In the cases where participants used a non-equivalent word order, they generally switched before beginning this 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.

[Figure 2 about here]

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.

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 was moved slightly towards the confederate's switch locations.

Experiment 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 is 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, these 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. (in press) 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, perfectly 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 study by Fokke et al. (2007) who manipulated the language background and switching behavior of participants' conversation partners to examine how this affects the participants' language choice.

The confederate-scripting technique not only provides new methodological possibilities in general. 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 explanotory 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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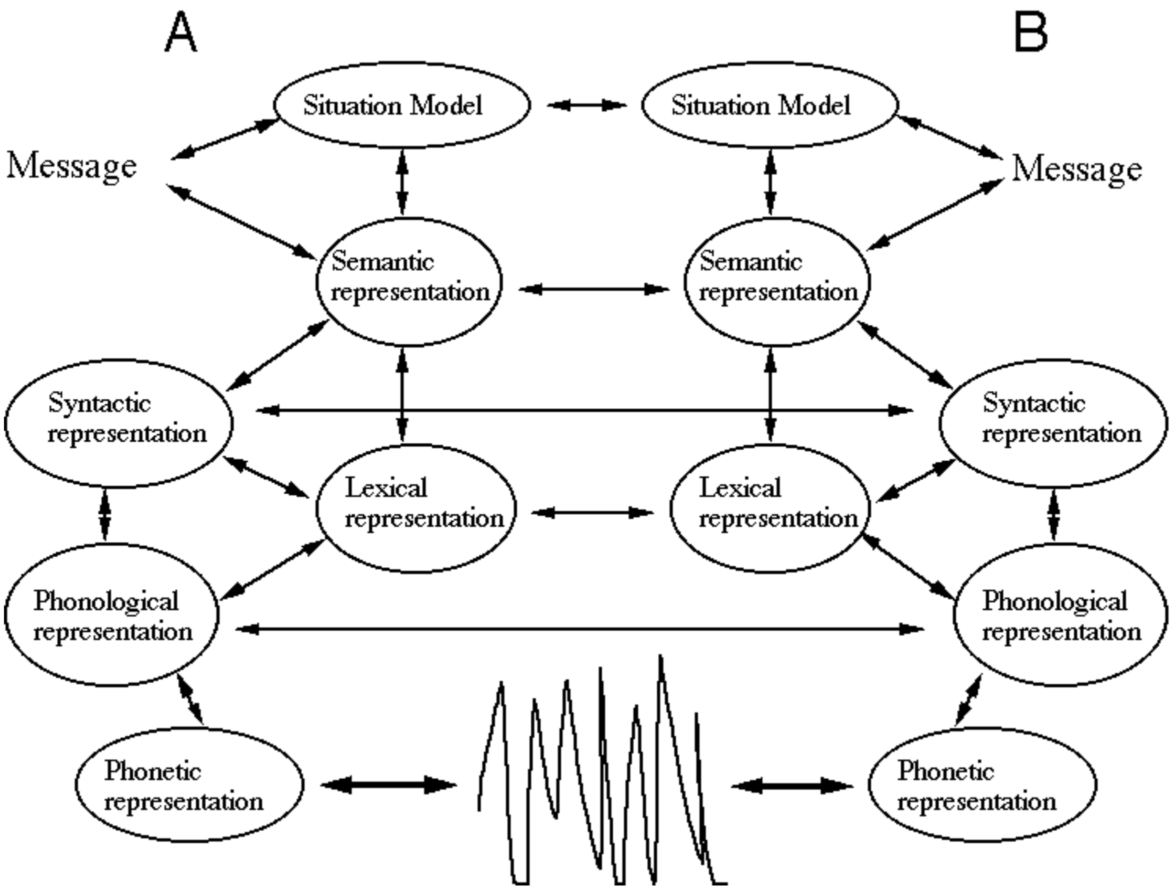
Figures

Figure 1


A
B
Situation Model
Situation Model
Message
Message
Semantic representation
Semantic representation
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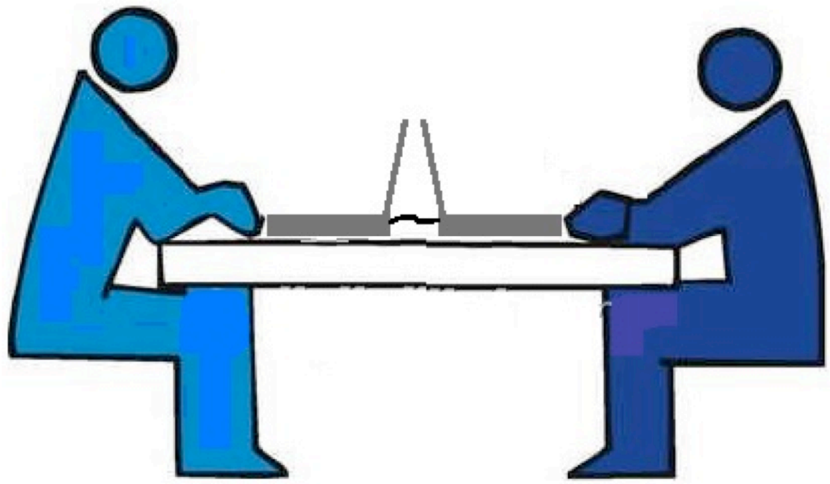
Phonetic representation

Figure 2



NOTES:

[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.

In addition, 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. It is not concerned, however, with code-switching or language interaction in bilingual dialogue.

[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.