Journal of Memory and Language 81 (2015) 91–104

Contents lists available at ScienceDirect

Journal of Memory and Language

journal homepage: www.elsevier.com/locate/jml

Interlocutor identity affects language activation in bilinguals

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ARTICLE INFO

Article history:
Received 18 February 2013
revision received 30 December 2014
Available online 17 February 2015

Keywords:
Bilingualism
Non-linguistic cue
Interlocutor
Language activation
Comprehension

ABSTRACT

In bilingual communities, individuals often communicate in one of their languages only, and they adjust to the linguistic background of different interlocutors with ease. What facilitates such efficiency? We investigated whether bilinguals' language activation is supported by non-linguistic cues (e.g., interlocutor identity). First, in an audio–visual task, early (proficient) and late (less proficient) Basque–Spanish bilinguals were familiarized with six novel interlocutors who spoke either Spanish, Basque, or both languages. Then, participants completed an audio–visual lexical decision task, in which the interlocutors produced test items in Spanish or Basque. Early, but not late, bilinguals' speed of processing decreased when the language that the interlocutors spoke during familiarization matched the language they spoke at test, relative to test trials when the interlocutors changed languages. Overall, results suggest that proficient and/or early bilinguals benefit from an association between language and interlocutor during (or even before) language comprehension, because they are able to predict the context-appropriate language based on non-linguistic cues, such as interlocutor context.

Introduction

Bilinguals from regions with two established languages are regularly exposed to both single and dual language interactional contexts. These interactional contexts (or language modes) are often defined by the interlocutor (e.g., Green & Abutalebi, 2013; Grosjean, 1998). For instance, a Basque–Spanish bilingual might communicate in Basque only with certain friends, but use both Basque and Spanish with their sibling. Here, we investigate whether the bilingual mind, during spoken language comprehension, actually adapts to interactional contexts based on prior knowledge about interlocutors. Specifically, we assess whether there is any bias in bilinguals' language co-activation depending on interlocutor context. Then, we consider the consequences of such activation patterns for models of bilingual lexical access and language activation.

Proficient bilinguals' language activation patterns are generally characterized as non-selective. That is, both languages of the bilinguals are active and processing is open to cross-language interaction during comprehension and production (for review, see Kroll, Bobb, & Wodniecka, 2006). Although the dual language system remains sensitive to language-specific cues, and bias toward one of the languages is possible at the conceptual, lexical, and phonological levels (e.g., Costa, 2005; Dijkstra, 2005; Elston-Güttler, Gunter, & Kotz, 2005; Green, 1998; Libben & Titone, 2009; Schwartz & Areas Da Luz Fontes, 2008; Van Hell & De Groot, 2008; Weber & Cutler, 2004). Therefore, multiple loci for language selection are available (Kroll et al., 2006). Indeed, most models of bilingual language

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http://dx.doi.org/10.1016/j.jml.2015.01.002
0749-596X/

processing assume the operation of a language cue that alters co-activation at some point during comprehension or production. This has been primarily demonstrated using explicit linguistic cues (e.g., sentence context, lexical items, etc.; e.g., Libben & Titone, 2009; Schwartz & Kroll, 2006). However, ecologically-valid situations of language processing include a range of *non-linguistic (contextual) information* (e.g., identity of interlocutors, situations, world knowledge, etc.). Monolingual speech comprehension is greatly supported by such cues (e.g., Grosjean & Li, 2013; Strand, 1999), and it is reasonable to assume that bilingual comprehension too is facilitated by similar domain-general mechanisms. Thus far, no clear and systematic distinction of language cues exist in the literature of bilingual language processing (e.g., explicitly linguistic vs. non-linguistic language cues), particularly in bilingual spoken language comprehension.

The phenomenon that non-linguistic information can interact with activation patterns has been recently demonstrated with respect to emotions. Emotions conveyed by words in a second language bias the mechanisms of co-activation during written language processing: words with negative valence, but not words with positive or neutral valence, inhibit access to the native language (Wu & Thierry, 2012). In addition to emotions, culturally biased icons/images, recognized as non-linguistic cues, also alter co-activation during speech production (Jared, Poh, & Paivio, 2013; Li, Yang, Suzanne Scherf, & Li, 2013; Zhang et al., 2013). When Chinese–English bilinguals were asked to engage in a conversation via a computer program while viewing an image of either an Asian or a Caucasian face, they spoke English less fluently when a Chinese and not a Caucasian face was presented (Zhang et al., 2013). Similar results were obtained in a picture-naming paradigm. When the naming language (Chinese vs. English) and the cultural cue (images of Asian vs. Caucasian faces) presented alongside the object to be named were congruent, a facilitation effect was observed (Li et al., 2013). Therefore, still images of faces may function as cultural primes and affect bilingual speech production. In these studies, the participants' only information about the faces was their socio-cultural identity, and participants had no direct experience with the language the person appearing in the images actually spoke. Considering real-world situations in the Unites States where the research took place, it is common that interlocutors of Asian heritage are native speakers of English (and do not speak Chinese); and vice versa, Caucasian interlocutors might speak little or no English. Hence, the faces presented in these studies could be considered less as real interlocutors and more as cultural icons or symbols associated with language communities.

No studies to date have investigated whether familiarity with the language background of interlocutors interact with bilingual language activation during comprehension. Thus far, only anecdotal evidence is available in support of this hypothesis. Bilinguals report that they develop an association between a language mode and specific interlocutors, and they often expect one specific language to be used with certain interlocutors (Grosjean, 1998). If bilinguals indeed develop associations between language modes and interlocutors or interactional contexts, it is a possibility that these associations, at some point during processing, shape language co-activation patterns (e.g., Green & Abutalebi, 2013). Such a finding would indicate that higher-level contextual information (interlocutor identity) interacts with the mechanisms of bilingual language activation and/or selection. Similar mechanisms that rely on higher-level contextual information have been proposed to support domain-general cognitive processing, including speech perception abilities in monolinguals (e.g., Elman & McClelland, 1988; Magnuson, Tanenhaus, & Aslin, 2008).

Yet, the role of non-linguistic factors (e.g., interlocutor identity) during the course of bilingual speech comprehension remains elusive. Most models of bilingual language control lack a clear account of how, when, or to what degree non-linguistic context might interact with co-activation patterns (for reviews, see Dijkstra, 2005; Dijkstra & Van Heuven, 2002; Kroll, Van Hell, Tokowicz, & Green, 2010). When considering comprehension, the models tend support the idea that activation is initially non-selective, because listeners have no control over which language is going to be used. Then, following the onset of the linguistic input, a bottom-up bias for the target language occurs, while cross-language representations still interact during (auditory) lexical access (e.g., Costa, 2005; Costa, La Heij, & Navarrete, 2006; Dijkstra, 2005; Green, 1998; Kroll & Dussias, 2004; Spivey & Marian, 1999; but see FitzPatrick & Indefrey, 2010; Rodriguez-Fornells, Rotte, Heinze, Nösselt, & Münte, 2002). Whilst when considering spoken language comprehension, the bottom-up bias can occur rapidly, based only on a small amount of low-level auditory linguistic information. For instance, when word-initial stop consonants of second language (L2) words were pronounced with first language (L1) appropriate voice onset times, initial language activation of bilingual listeners were biased toward the L1 (Ju & Luce, 2004).

The more recent adaptive control hypothesis (Green & Abutalebi, 2013), however, considers bilingual language processing from broader perspective than the previous models. It proposes that bilinguals are sensitive to specific interactional contexts, such as single-language context (e.g., when only one language is used in the environment), dual-language context (e.g., when both languages are present in the environment but spoken by different interlocutors), and dense code-switching context (e.g., when interlocutors regularly interleave their languages within the same phrase or utterance). Bilinguals are able to adapt to these contexts via different cognitive control processes involved in language selection. Presumably, these cognitive control processes can exploit non-linguistic cues, such as voice, face, or gesture. For instance, in a dual-language context, different interlocutors can be associated with different languages or interactional contexts. When a bilingual addresses, or is addressed by, a new interlocutor, it might elicit a change in the bilingual's language activation, depending on the interactional context linked to the given interlocutor. According to the adaptive control hypothesis, in this case, the cognitive process involved in language mode adjustment is *salient cue detection*, because an interlocutor might function as a salient (non-linguistic) cue aiding the bilinguals' language control mechanisms (Green &