Acta Psychologica 178 (2017) 12–17

Contents lists available at ScienceDirect

Acta Psychologica

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

On national flags and language tags: Effects of flag-language congruency in bilingual word recognition☆

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ARTICLE INFO

Keywords:
Word recognition
Bilingualism
Language membership
Flag-language congruency
BIA-model

ABSTRACT

French-English bilinguals performed a generalized lexical decision experiment with mixed lists of French and English words and pseudo-words. In Experiment 1, each word/pseudo-word was superimposed on the picture of the French or UK flag, and flag-word congruency was manipulated. The flag was not informative with respect to either the lexical decision response or the language of the word. Nevertheless, lexical decisions to word stimuli were faster following the congruent flag compared with the incongruent flag, but only for French (L1) words. Experiment 2 replicated this flag-language congruency effect in a priming paradigm, where the word and pseudo-word targets followed the brief presentation of the flag prime, and this time effects were seen in both languages. We take these findings as evidence for a mechanism that automatically processes linguistic and non-linguistic information concerning the presence or not of a given language. Language membership information can then modulate lexical processing, in line with the architecture of the BIA model, but not the BIA + model.

How might non-linguistic information concerning the presence of one or another language affect language comprehension in bilinguals? In the present study we examine this issue by presenting national flags to our bilingual participants while they performed a simple word recognition task with mixed lists of words from their two languages. National flags provide a strong association between a non-linguistic object and a given language, at least for certain nations such as the UK and France. In the present study we examine whether such strong associations can modulate linguistic processing even in conditions where the non-linguistic language cue is uninformative with respect to the nature of the linguistic information being processed for the task at hand.

One particular theoretical framework for bilingual language processing predicts such automatic, irrepressible, non-linguistic influences on language comprehension in bilinguals. That is the Bilingual Interactive Activation (BIA) model (Grainger & Dijkstra, 1992; see also Grainger, Midgley, & Holcomb, 2010, for a developmental extension of this model; and Léwy & Grosjean, 2008, for an interactive-activation account of spoken language comprehension in bilinguals). For the present purposes, the key concept within the overall framework of the BIA-model is the notion of a language node, introduced in order to replace the notion of a language tag that had been popularized in the 1970s (e.g., Albert & Obler, 1978; see Green, 1998, for a model that continues to apply the notion of language tag). Just like a language tag, language nodes provide a signal that the word being processed is a word in a given language. That is, language nodes provide information about language membership, and with language nodes this is done probabilistically as opposed to the all-or-none manner of language tags. Crucially, unlike language tags, language nodes are no longer strictly linguistic information processors, since they can receive information concerning the probability that a given linguistic stimulus belongs to language x, and this input can come from both linguistic and non-linguistic sources (Schwartz & van Hell, 2012). Language nodes integrate information from multiple sources about the presence or not of a given language, and automatically modulate the activity of lexical representations in one or the other language as a function of language node activity. The BIA-model therefore predicts that non-linguistic information concerning the presence of a given language should automatically influence the processing of linguistic information in that language.[1]

In the present study we test the prediction of the BIA-model that non-linguistic information can modulate the processing of linguistic information in bilinguals via the key modulatory role of language nodes. What is the evidence to date that non-linguistic information can

☆ This research was supported by grant ANR-11-LABX-0036 (BLRI).
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[1] Note that this prediction is not made by the BIA + model (Dijkstra & van Heuven, 2002). In this version of the family of BIA-models, language nodes become simple language tags that do not receive input from non-linguistic sources and cannot modulate activity in lexical representations.

http://dx.doi.org/10.1016/j.actpsy.2017.05.004
Received 17 January 2017; Received in revised form 4 May 2017; Accepted 15 May 2017

impact on the relative ease with which a bilingual can process words in that language or the other language? Some evidence along these lines has been obtained in studies investigating the effect of people as language cues (for a review, see Hartsuiker, 2015). Molnar, Ibáñez-Molina, and Carreiras (2015) showed Basque-Spanish bilinguals video fragments of six people who spoke Basque, Spanish or both. In a second phase, the bilingual participants had to perform a lexical decision task based on video fragments in which the same six people produced words/pseudo-words. The results showed a performance decrease when those who only spoke Basque or Spanish in the initial video fragment, produced a word in the language than they had not used in the initial video. While this was only the case for participants who were early bilinguals, it does provide evidence that interlocutor identity can be used as a cue to prepare for processing linguistic information in a given language (see Martin, Molnar, & Carreiras, 2016, for ERP evidence in line with this).

Further evidence has been found in studies examining the effect of interlocutor identity on language production in bilinguals in situations involving communication with persons via a computer interface (Woumans et al., 2015; Zhang, Morris, Cheng, & Yap, 2013). Woumans et al. (2015), for example, first let bilinguals (Dutch-French; Spanish-Catalan) get acquainted with several people using one or the other language. In the next phase, participants saw the same people produce words. The task of the participants was to produce an associated word in the same language. The results showed an effect of the compatibility of the language used in the two phases of the experiment, but only during the first trials. This was seen as evidence that interlocutor identity can be used as a language cue during bilingual language production. Though, this association disappears when it becomes clear that the person is not a stable language cue (i.e., when it becomes clear that they speak both languages). Using a racial cue to language identity, Zhang et al. (2013) reported that Chinese-English bilinguals interacted more fluently in English when they saw a Caucasian face than an Asian face. A similar finding was reported by Li, Yang, Scherf, and Li (2013), who found that picture naming was influenced by the race (Asian or Caucasian) of the person holding the frame containing the to-be-named picture.

Evidence that the association of a person with a given language, either via racial cues or by prior experience, can be used to prepare for speaking a given language is an important finding, but does not provide direct evidence for an automatic influence of non-linguistic cues on the processing of linguistic information in bilinguals. This is because such cues can be used to voluntarily prepare for processing information in a given language (i.e., I think this person can only speak Spanish, therefore I expect to hear Spanish). More directly relevant for the present study, is another observation of Zhang et al. (2013), who reported that Chinese-English bilinguals spoke more fluently in English about cultural icons associated with the USA (e.g., Mount Rushmore) than when speaking about a cultural icon associated with China (e.g., the Great Wall of China). In a similar vein, Jared, Pei Yun Poh, and Paivio (2013) reported that Chinese-English bilinguals living in Canada named pictures of objects faster when the to-be-named object was culturally associated with the naming language. Thus, for example, a picture of a typical Canadian mailbox was named faster in English than in Chinese, and the opposite was found for a typical Chinese mailbox.

However, this influence of cultural associations on spoken language fluency could simply be due to participants having learned to speak about a given object more via the associated language than via the other language, and these findings might not speak to the issue of non-linguistic control of linguistic processing (see Jared et al., 2013, for an explanation of their findings along these lines). It was therefore important to demonstrate that exposure to culturally associated images also affected speaking about culture-neutral images. Zhang et al. (2013) provided such a test, but unfortunately, this was only done after the participants had first described the culture-laden images, and the effect could therefore be linguistic in nature and not due to automatic non-linguistic influences on the processing of linguistic information (see Hartsuiker, 2015, for a further critique of this study).

In the present study we provide an arguably stronger test of the automatic influence of non-linguistic information associated with a given language on the processing of linguistic information in bilinguals. We use national flags as among the non-linguistic stimuli that have the strongest association with a given language. We use the generalized lexical decision task (e.g., Grainger & Beauvillain, 1987; Thomas & Allport, 2000) as one of the simplest tasks that requires the processing of linguistic information without explicitly requiring access to knowledge about the language associated with that linguistic information. Finding an influence of non-linguistic cues to language membership with this particular task would therefore constitute strong evidence for the automatic processing of such cues during language comprehension in bilinguals. Furthermore, given that each word/pseudo-word was associated equally often with the two flags during the experiment, the information carried by the flag stimulus could not be explicitly used to improve performance.

It is important to note that in the present study the flag stimuli had zero predictive value with respect to the language of the target word. This is a very different situation compared with all prior research using flag stimuli as cues for language membership, where the flag is artificially used to specify the language that participants should employ when processing ambivalent stimuli (e.g., picture naming: Calabria, Branzi, Marne, Hernández, & Costa, 2015; Prior & Gollan, 2013). In this prior research, participants used the flag stimuli voluntarily in order to prepare for linguistic processing in a given language, whereas in the current experiment we are interested in the more automatic, reflexive activation of language membership information from national flags. Here, a useful analogy is the well-known distinction between endogenous (voluntary) and exogenous (reflexive) orienting of attention (Müller & Rabbitt, 1989; Posner, 1980; Theeuwes, 1991). Unlike endogenous orienting, exogenous orienting is fast-acting and operates independently of cue validity, hence the conditions used in the present experiment in order to examine the impact of national flags as exogenous cues to language membership. In sum, in the present study we are interested in knowing whether or not national flags can automatically influence linguistic processing in bilinguals, which is a very different situation from one where flags are used to artificially induce processing in a given language.

1. Experiment 1

1.1. Method

1.1.1. Participants

Twenty native speakers of French with expertise in English as a second language participated in this experiment (three males; average age of 21 years). Prior to the experiment, the participants filled in a questionnaire about their French and English proficiency, regarding their age-of-acquisition, the average percentage of current language use and during childhood, and rated their level of speaking, writing, and reading skills in French and English on a 7-point scale, with one being very bad and seven being very good (see Table 1). After the experiment they also completed a vocabulary test for both languages: LexTALE-French (Brysbaert, 2013) and LexTALE-English (Lemhöfer & Broersma, 2012).

1.1.2. Stimuli

50 French words that were not cognates with English (mean frequency[2] = 5.73 Zipf; New, Pallier, Ferrand, & Matos, 2001), 50 English words that were not cognates with French (mean fre-

[2] The Zipf scale expresses frequencies as log10 occurrences per billion (van Heuven, Mandera, Keulers, & Brysbaert, 2014).