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Mental control, language tags, and language nodes in bilingual lexical processing

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In this paper Green proposes an inhibitory control (IC) model of bilingual lexical processing. At the core of Green's arguments is the notion of "mental control," formulated in terms of inhibition, control schemas, and a supervisory attentional system. The very notion of control, it seems, suggests some sort of intentional, exogenous force at work (e.g., the supervisory attentional system). Presumably mental control differs from automatic processes (Schneider & Shiffrin, 1977), yet in the IC model there is no precise computational specification of how the various parameters of the control system actually interact to determine automatic bilingual processes. In a computational view, the IC model has quite some symbolic AI flavor (e.g., with goal-oriented decision boxes and control schemas), but it also attempts to integrate activation-based accounts (e.g., interactive activation mechanisms). Again, because the model remains at a rather conceptual level as presented, it is difficult to determine how successful it will be in combining symbolic and connectionist approaches in understanding bilingual processing.

According to the IC model, there are multiple levels of control, with each level associated with a specific schema, from high-level event scripts to low-level articulatory controls. The particular level at which the IC model operates is an intermediate level, the lemma level, whereby an inhibitory mechanism suppresses the activation of lemmas that are tagged as belonging to the language other than the intended one. Crucial to the functioning of this mechanism are the language tags, tags that are believed to be part of the conceptual system of the lexicon. But what is the nature of the language tags? In what form do these tags exist in the mental representation? How can we identify them? These are some of the simple questions that arise immediately, but seem to be left unanswered in the IC model.

Imagine that in our bilingual lexical representation we tag every item of the lexicon as belonging to one or the other language, and that the tag is part of the semantic or syntactic information of the word (i.e., part of the lemma). Multilinguals would correspondingly assign multiple types of tag, one for each language. If this were true, we should probably expect language tags to play a pivotal role in distinguishing lexical items of one language from those of another, eliminating or minimizing inter-lingual lexical interferences, at least on the semantic or syntactic level. We could suppose that, due to their conceptual or morphological transparency, these tags would receive strongest weights in inter-lingual tasks, possibly realized as features in a weight vector such as the ones in connectionist networks. The strong weights can therefore serve easily to differentiate words in the two languages. However, there is overwhelming empirical evidence for the existence of both priming and inference effects in a variety of inter-lingual experimental tasks. Thus, it is difficult to see that the language tags can play a significant role in differentiating the two lexicons, or that language tags can be easily identified, or that even there are language tags. Some recent work by French and Ohnesorge (1997) shows that distinct patterns associated with the two lexicons may emerge as a function of the probabilistic learning of mixed language sentences, with no distinct language tags, in a simple recurrent connectionist network (Elman, 1990).

If there are no language tags, how can we explain language switching? The IC model assumes that language switching takes time, since to switch to another language involves the inhibition of previous language tags. Recent studies, however, have again cast doubt on the notion that there is a cost associated with language switching, especially in natural speech situations (Grosjean, 1988, 1997; Grosjean & Miller, 1994; Li, 1996). Moreover, it seems that natural code-switching does not necessarily involve prior planning, and may be constructed on the fly. In the IC model, the inhibition of a particular stimulus shuts down the activation of all other related stimuli in the same language from top down; this assumption seems to contradict several activation-based accounts that the bilingual's two languages may be always activated, though the strength of the activation differs in specific linguistic situations, depending on the frequency of the target words, the sentential context, the speaker's proficiency in the two languages, and the speech mode (Grosjean, 1988, 1997; Li, 1996).

Towards the end Green draws a parallel between the language tags in the IC model and the language nodes in the Bilingual Interactive Activation (BIA) model (Grainger, 1993; Dijkstra & van Heuven, 1998). The language nodes in the BIA model function to reinforce lexical activations of the currently activated language, while at the same time decreasing lexical activations in the other lexical system. It is quite unclear at this point whether the language nodes are ad hoc constructs or necessary components of bilingual processing, just as it is unclear whether language tags are necessary. The seemingly separate lexical representations of the two lexicons, and the related inter-lingual priming/inference effects, might arise as a result of lexical and grammatical learning in a simple recurrent network (as discussed earlier) or in a self-organizing neural network, in which no distinct labels are given to items of the two or more languages. For example, in a self-organizing feature map model of the lexicon such as the DISLEX model of Miikkulainen (1993, 1997), words from both languages may exist in the same topological map, but over time the network can develop localized patterns of activity in learning the mappings between phonology/orthography

and semantics or between morphology and semantics. These localized patterns of activity may correspond to the learner's internalized, distinct representations of the two lexicons. Thus, an abstract or supra-lexical level of language nodes or language tags is unnecessary, but the effects of the language nodes or tags can be captured precisely in such a system.

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