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LEXICAL PROCESSING IN BILINGUALS AND MULTILINGUALS: THE WORD SELECTION PROBLEM

1. INTRODUCTION

Some multilinguals understand and speak many different languages. A lecture at the Second International Conference on Third Language Acquisition and Trilingualism (Leeuwarden, the Netherlands, September 13-15, 2001) discussed the linguistic abilities of a person who mastered 17 different languages at least reasonably fluently. Such multilinguals must have stored vast numbers of words in their mental lexicon, and it would appear to be as difficult to retrieve just the right word from such a large database as it would be to find a needle in a haystack. Still, these multilinguals appear to be able to communicate rather smoothly, without suffering from many misperceptions of words or cross-linguistically based speech errors. How can their word retrieval system operate so efficiently? We will refer to this issue as the *word selection problem.*

Derailments of language processing in multilinguals might especially be expected if one realizes that already monolinguals are capable of selecting/identifying a word within a third of a second from a lexicon of 50,000 words or more (see Aitchison, 1987: 5-7). If they are reasonably fluent in their L2, proficient bilinguals must have 10,000s of additional word forms for use in their second language, and the number of extra words from yet other languages in multilinguals must be considerable. This implies that during reading and speaking, thousands of extra words are possible targets for recognition or articulation. And yet, the cost associated to the ability of processing more than one language seems to be relatively mild. In their comparison of bilingual and monolingual performance in different tasks, Ransdell and Fischler (1987: 400) concluded that "Becoming fluent in a second language appears to have only slight impact on the ability to process the first". They observed, for instance, that bilinguals made English (LI) lexical decisions on words that were only about 125 ms slower than those of monolinguals (given RTs of 700-900 ms), but just as accurate. In all, multilinguals thus appear to perform an amazing feat when they recognize and produce words from their many

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languages, not (just) in the sense that they are able to store so many words, but especially in that they are able to retrieve the right ones so quickly and without flaw.

This chapter considers which factors may help multilinguals to solve their word selection problem during visual word recognition. Basing ourselves upon evidence from the bilingual domain, we will evaluate a number of solutions to the problem of word selection in the multilingual:

(a) Multilinguals are able to access just the task-relevant language (language selective access) and to switch between their languages when needed.

(b) Word candidates from different languages are automatically activated during lexical selection (language nonselective access), but multilinguals can control their relative language activation in a top-down way (i.e., if they want to).

(c) The characteristics of lexical items from different languages suffice to account for the word selection process in multilinguals. Word candidates from different languages are activated during lexical selection, and multilinguals have no top-down control over the activation of words from different languages.

During our evaluation, we will contrast available models of word recognition with respect to their basic underlying assumptions, and extend their views from monolinguals and bilinguals to multilinguals.

2. THE INTERACTIVE ACTIVATION MODEL FOR MONOLINGUAL WORD RECOGNITION

As a starting point, let us consider what we know about word selection in monolingual language comprehension (see also de Bot, in press). A well-known monolingual model for visual word recognition is the Interactive Activation (IA) model (McClelland & Rumelhart, 1981, see Figure 1). This model comprises units (nodes) corresponding to linguistic representations at three hierarchically arranged levels: features, letters, and words. Feature nodes detect the presence or absence of visual features (i.e. line segments) of letters at different positions in a word. Facilitatory connections exist between nodes from adjacent representation levels and inhibitory connections between nodes at the same level. An input letter string "switches on" particular features at each letter position, which subsequently excite letters that contain them and inhibit letters for which they are absent. Each activated letter then excites in parallel all words having that letter at the correct spatial position, while all other words and letters in that position are inhibited. Subsequently, all activated words inhibit each other (lateral inhibition) while they excite their component letters (top-down feedback). After a number of processing cycles, an asymptotic activation value is reached in some word and letter units. Word recognition can be assumed to take place if an activation threshold set at the word level is crossed. When the input is turned off, activation gradually decreases towards initial or resting level values due to activation decay.

In the first stages of word recognition, many word candidates are activated in parallel (see also Schönpflug, this volume). Especially words that differ from the presented target word in only one letter become activated, because they match the target to such a large extent. Words that differ from a target word at only one letter position are called *neighbors.* For instance, upon presentation of a four-letter word like WEND, words that share three letters with the target word become relatively active because of the bottom-up support from the three activated letter units. Examples of neighbors of WIND are BIND, KIND, WAND, WILD, and WINK. (Further note that WIND is a homograph, implying that without context several meanings could become available). These neighbors subsequently inhibit other less activated words, thus helping each other (gang effect). Over time, they also start to affect each other's activation and that of the target word negatively through lateral inhibition. The IA model has been able to account for many neighborhood effects reported in the literature (for a discussion in the context of bilingualism, see Van Heuven, Dijkstra, & Grainger, 1998).

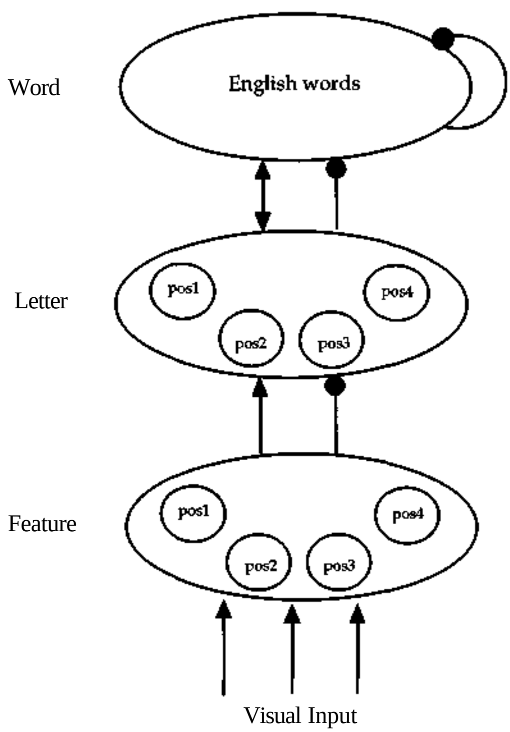

Figure 1. The Interactive Activation model of visual word recognition. Normal arrows indicate excitatory connections, lines with ball heads indicate inhibitory connections.