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AUTHOR Guttentag, Robert; And Others
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ABSTRACT

An experiment is described that is designed to test for the operation of an input switch mechanism in bilinguals. Their ability to selectively avoid processing words presented in one of their languages while they are attending to words presented in their other language is described. The 20 subjects were all French-English bilinguals. The specific method used was the flanker task, in which three vertically-arranged words are presented, the center word being the target and the two outside the flankers. Four types of flanker-target relationships were included. From the response times, it was concluded that the subjects were obliged to process the flanker words semantically, which suggests that bilinguals do not switch off the processing of words in one language even when they are engaged in processing words in their other language system. (EKN)

Obligatory Processing of Words in Two Languages by Bilinguals

Robert Guttentag

University of Winnipeg

Marshall Haith & Gail Goodman

University of Denver

Jean Hauck

University of Winnipeg

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Obligatory Processing of Words in Two Languages by Bilinguals

An experience commonly reported by bilinguals is that they are sometimes momentarily unable to comprehend a message when the language of presentation is unexpected. For instance, a person fluent in both French and English might turn on the radio expecting to hear French and then experience a temporary difficulty in comprehension when it turns out that the radio was set to an English-language station. This phenomenon suggests the existence of some form of input-switch mechanism which operates to turn-on, or activate, comprehension procedures in just one of the bilingual's language systems at a time, and just such a mechanism has been included in several models of bilingual language processing.

The experiments we conducted were designed to test for the operation of an input switch mechanism in bilinguals by examining their ability to selectively avoid processing words presented in one of their languages while they are attending to words presented in their other language system. The specific task we used was the flanker task, which involves presenting stimuli consisting of word triplets arranged vertically. For each stimulus the center word is the target, and two flanking words are the flankers. In our experiments, the words were selected from four semantic categories, and subjects were required to determine, for each individually presented stimulus, whether or not the target was a member of a specified pair of semantic categories. For instance, in Experiment 1 the categories were metals, articles of clothing, trees, and types of furniture. For each stimulus, subjects made one response if the target was either a metal or an article of clothing, and a different response if the target was either a tree or the name of a piece of furniture.

Previous research with this paradigm has demonstrated that, although subjects are instructed to process only the targets on each trial, the

meaning of the flanker words affects their performance. In all previous studies, however, the language of the flankers was always the same as the language of the targets. In our study, we asked whether subjects would be obliged to process the flanker word when the language of the flankers was different from the language of the targets.

The subjects in both of our experiments were French-English bilinguals. In Experiment 1, the target words were always printed in French, and the flanker words were always printed in English. To further encourage subjects to operate entirely in French during the experiment, we required verbal responses, with subjects responding "oui" to targets from one pair of semantic categories and "non" to targets from the other pair of semantic categories.

With this procedure, in which the targets were always printed in French and the flankers always in English, there was no reason for a subject's input mechanism ever to be switched to processing information in English. Consequently, if there is such a thing as a bilingual input switch, then the subjects in our study should have readily been able to avoid processing the flanker words.

In order to determine if subjects were able to successfuly avoid processing the flanker words, we included four types of flanker-target relationship in the experiment. An example of each type of target-flanker relationship is presented in Figure 1. As you can see, in condition 1 the flankers were translations of the targets. In condition 2, the flankers were not translations of the targets, but were from the same semantic category as the targets. In condition 3, the flankers were from a different category from the targets, but corresponded to the same response as the

targets. For instance, in the example given, the subjects would have responded "oui" to both metals and clothing. In condition 4, the flankers and targets corresponded to different responses.

There were 20 subjects in the experiment, all of whom were fluent in both French and English. However, 13 of the subjects had learned French prior to their acquisition of English, and I will be referring to these subjects as being French dominant. The remaining seven subjects learned English prior to their acquisition of French, and I will be referring to them as English dominant.

The results of Experiment 1 are presented separately for the English and French dominant subjects in Figure 2. Keep in mind as you look at the data that the actual targets and flankers were identical in each condition - - it was only the way in which targets and flankers were paired that differentiated the stimuli in the different conditions.

As you can see, target response times were <u>not</u> identical in the four conditions. This finding indicates that the meaning of the flanker words affected responses to the targets. Thus, subjects were unable to avoid processing the flankers, even though the flankers were always printed in English, while the targets were always printed in French.

The actual pattern of responses across conditions is also of some interest. Note that for both subject groups responses were faster in the SC condition, in which the flankers and targets were from the same category, than in the SR condition, in which the targets and flankers were from different categories. This finding suggests that the flankers affected some aspect of the target categorization process. Responses were not, however, significantly faster when the targets and flankers

corresponded to the same response, as in the SR condition, than when they corresponded to different responses, as in the DR condition. This finding indicates that the flankers did not affect response selection or production. Finally, note that the two subject groups were differentially affected by the translation flankers. The French dominant subjects, for whom the flankers were presented in their second language, took longer to respond in the translation condition than in the same category condition. A similar effect was not found, however, for the English dominant subjects.

We were puzzled by, and actually somewhat uneasy about, this last finding, so we conducted a second experiment to test the robustness of the phenomenon. Experiment 2 was similar to Experiment 1, except that in Experiment 2 we tested only French dominant subjects, but we tested them on two blocks of trials - - in one block, the targets were French and the flankers English as was the case in Experiment 1, while in the other block the targets were English and the flankers were French.

The results are presented in Figure 3. As you can see, the findings were very similar to the results from Experiment 1. That is, there was a significant effect of conditions, indicating that subjects were unable to avoid processing the flanker words. Also, responses were faster in the SC condition than in the SR condition, indicating that the flankers affected target categorization, while responses in the SR and DR conditions did not differ significantly, indicating that the flankers did not affect response selection or production. Finally, when the flankers were printed in the subject's second language, responses were slower in the translation condition than in the same category condition, but a similar effect was not present when the flankers were printed in the subject's first language.

We believe this last finding to result from small differences in the rate of processing of first and second language printed words by our bilingual subjects. We hypothesize that when the translation flankers are in the subject's second language, the flankers produce a second, slightly delayed, input to the identical word code activiated by the target. We further hypothesize that this second, delayed input for some resson delays or interferes with categorization of the target.

Whatever the explanation of the effects observed in the translation condition, the findings from the present study clearly indicated that the subjects were obliged to process the flanker words semantically, even though the flankers and targets were printed in different languages. This finding cannot be reconciled with any version of the input switch hypothesis which proposes that the switch operates at the level of semantic processing of individual printed words. The present findings do not rule out the possibility that some form of input switch might operate at the level of the application of grammatical rules during comprehension. Nevertheless, the results suggest that bilingual subjects do not switch off the processing of words in one language even when they are engaged in processing words in their other language system.

Figure 1

Examples of the stimuli presented in each condition. Note that "metals" and "clothing" correspond to the same response.

	Translation (T)	Same Category (SC)	Same Response (SR)	Different Response (DR)
Flanker	iron	copper	hat	elm
Target	fer	fer	fer	fer
Flanker	iron	copper	hat	elm

Figure 2

Results from Experiment 1

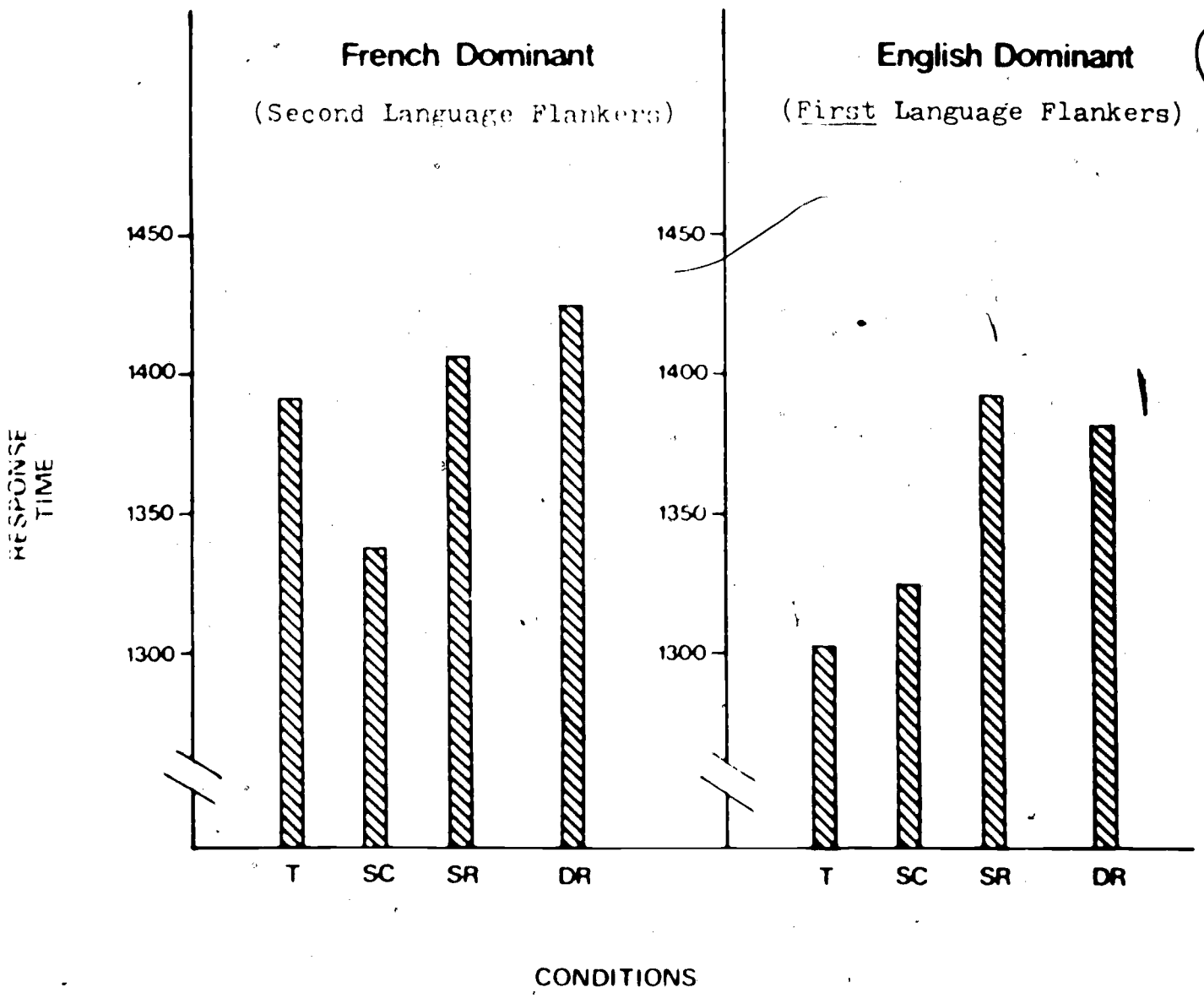

Figure 3

Results from Experiment 2