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Evidence for long-term cross-language repetition priming in conceptual implicit memory tasks

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Abstract

Previous studies have failed to find evidence for long-term cross-language repetition priming (e.g., presentation of the English word *frog* does not facilitate responding to its Dutch translation equivalent *kikker* on a later presentation). The present study tested the hypothesis that failure to find cross-language repetition priming in previous studies was due to the use of tasks that rely primarily on lexical or orthographic processing of the stimuli instead of conceptual processing. Consistent with this hypothesis we obtained reliable cross-language repetition priming when conceptual implicit memory tasks were used. The present results support theories of bilingual memory that assume shared conceptual representations for translation equivalents. In particular, our results support the concept mediation model as they indicate that bilinguals access the conceptional representation directly from the L2 lexical representation (i.e., without first accessing the L1 lexical representation).
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It is estimated that the majority of the people in the world are bilingual. It is not surprising therefore that many researchers have become interested in how language is represented and processed in people who master more than one language. A question that has received considerable attention in the literature is whether the two languages of a bilingual person have separate or shared (also called integrated) representations. Initially researchers assumed separate representations for translation equivalents (e.g., Kolers, 1963). Many current theories of bilingual processing and memory representation, however, assume that representations of translation equivalents are integrated to some degree (e.g., Kroll & Stewart, 1994; Potter, So, Von Eckhart, & Feldman, 1984). A number of findings have been taken to support this view. For example, semantic priming effects are obtained even when the prime and target words are presented in different languages (e.g., de Groot & Nas, 1991; Kirsner, Smith, Lockhart, King, & Jain, 1984). Additionally, Stroop interference is obtained when ink colors must be named in a language different from the one in which the words are printed (see MacLeod, 1991, for a review). Also, in a category-verification task, reaction times are as fast when the category and its member are presented in the same language as when they are presented in different languages (e.g., Caramazza & Brones, 1980). These and other findings are consistent with the notion of shared bilingual memory representations (see Francis, 1999, for a review).

Results obtained with the long-term *repetition priming* paradigm, however, have provided little evidence for

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shared representations.[1] Repetition priming refers to the common finding, well documented in the monolingual memory and language literature, that participants respond faster and more accurately to recently studied words than to words that have not been studied recently (e.g., Jacoby & Dallas, 1981; Scarborough, Cortese, & Scarborough, 1977; Zeelenberg, Wagenmakers, & Raaijmakers, 2002). The question is whether repetition priming is also obtained when the first and second presentation of a word in the experiment are in a different language (e.g., does the previous presentation of the English word *frog* facilitate responding to its Dutch translation equivalent *kikker*?). A number of experiments using the lexical decision task indicate that no such effect is obtained (Gerard & Scarborough, 1989; Kirsner, Brown, Abrol, Chadna, & Sharma, 1980; Kirsner et al., 1984; Scarborough, Gerard, & Cortese, 1984) when the translation equivalents are noncognates (i.e., when they are orthographically and phonologically dissimilar). The absence of cross-language repetition priming seems to be inconsistent with the idea of shared representations.

Several researchers (for recent reviews, see de Groot, 2002; Gollan & Kroll, 2001) have argued, however, that cross-language repetition priming is not obtained in lexical decision because performance in lexical decision depends primarily on orthographic or lexical processes. In accordance with many current theories of monolingual and bilingual language processing, these researchers distinguish between a lexical and a conceptual level of representation. It is often assumed that the lexical level represents the orthography of a word whereas the semantic or conceptual level represents the meaning of a word. Most current theories of bilingual memory representation assume *separate* or *language specific* representations for translation equivalents at the lexical level of representation and *shared* or *integrated* representations at the conceptual level of representation. Because these theories assume separate lexical representations for translation equivalents they predict no cross-language repetition priming for tasks that tap lexical processes.

A closely related explanation for the absence of cross-language repetition priming in lexical decision is provided by the transfer appropriate processing (TAP) framework (Blaxton, 1989; Morris, Bransford, & Franks, 1977; Roediger, 1990; Roediger & Blaxton, 1987). The TAP framework accounts for a number of findings in the implicit memory literature (see Roediger & McDermott, 1993, for a review). According to the TAP framework, memory performance and hence priming, depends on the extent to which the processes at retrieval recapitulate the processes at encoding. Within the TAP framework a distinction is often made between perceptual and conceptual memory tasks. Performance in *perceptual* tasks relies primarily on the processing of the physical attributes of the presented stimuli whereas performance in *conceptual* tasks relies primarily on the processing of the semantic attributes of the presented stimuli. Cross-language repetition priming is not found in tasks that emphasize perceptual processes, because there is little or no overlap in the perceptual processes at study and test.

The interpretation that priming in lexical decision depends primarily on perceptual, orthographic or lexical processes and not conceptual processes is consistent with the ideas of many researchers in the field of monolingual repetition priming (e.g., Becker, Moscovitch, Behrmann, & Joordens, 1997; Bowers, 2000; Zeelenberg & Pecher, 2002). It should be noted, however, that the evidence supporting the hypothesis that cross-language repetition priming is not obtained in lexical decision *because* priming depends on lower level form-based processing is circumstantial. There is no direct evidence supporting this hypothesis. The aim of the present study was to provide a more direct test of this hypothesis.

A prediction that follows from the reasoning outlined above is that cross-language repetition priming should be obtained in implicit memory tasks that rely on *conceptual* processing. Some support for this idea was obtained by Durgunoglu and Roediger (1987). They used the TAP perspective to account for the fact that in some memory tasks cross-language transfer is observed while in other tasks no such transfer is observed. They predicted that evidence for cross-language transfer would be found in tasks that emphasize conceptual processing, but not in tasks that emphasize perceptual processing. In agreement with this prediction, their results showed that in free recall, a conceptually driven task, language at study played little role. However, in word fragment completion, a data-driven task, language at study played a major role and performance was no better for words studied in a different language than for nonstudied words (i.e., there was no evidence for cross-language repetition priming).

The results of Durgunoglu and Roediger (1987) provide some support for the idea that cross-language repetition priming might be obtained in tasks that rely on conceptual processing. It should be noted though that the Durgunoglu and Roediger study provides no

[1] Researchers often distinguish between short-term and long-term priming (Bowers, 2000; see Wagenmakers et al., 2003, for a discussion of recent quantitative models of short-term and long-term priming). Short-term priming refers to a paradigm in which the prime stimulus is presented immediately prior to the target stimulus (e.g., Forster & Davis, 1984; Huber, Shiffrin, Lyle, & Ruys, 2001). Long-term priming refers to a paradigm in which the prime and target are separated by multiple stimuli (and often several minutes or even hours). The present study is concerned with long-term priming. Hence, whenever when we discuss repetition priming in the present article we refer to the long-term repetition priming paradigm.

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