A direct processing route to translate words from the first to the second language: Evidence from a case of a bilingual aphasic

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Introduction

How are the lexical representations corresponding to each of the languages used by a bilingual individual related within the lexical processing system(s)? Current theories of the bilingual lexical system share the assumption that the lexico-semantic level of representation and processing is common to both languages. However, there are disagreements among models on whether and how the word form representations in the first (L1) and second language (L2) are inter-connected.

According to Kirsner, Lalor, and Hird (1993), only cognate forms (e.g., the French word /tabl/ and the English word /teɪbl/, both meaning "table") are inter-connected within the bilingual lexicon, whereas Kroll and Stewart (1994) argued that the existence of cross-language connections was not dependent on the words being cognates or not. Thus, the "revised hierarchical model" (Kroll & Stewart, 1994) assumes direct connections between each L1 and L2 corresponding word forms, although L2 to L1 connections are supposed to be stronger than L1 to L2's.

Furthermore, contrary to theories of lexical processing in monolinguals (e.g., Caramazza & Hillis, 1990), these theories do not draw any explicit distinction between input and output lexical representations and processing. Therefore, it is unclear at or between which levels are connections between word forms needed to be assumed to account for the lexical performance of bilinguals.

Here, we report the case of a French/English bilingual aphasic patient whose pattern of performance in naming and translation provides evidence relevant to these issues.

Case report

SM, a right-handed 40-year-old woman with 15 years of formal education, suffered a left sylvian CVA in 1996. A Broca's aphasia was diagnosed and, at the time of this study (in 2004), she still presented agrammatism and word-finding difficulties in confrontation naming and spontaneous speech. However, she presented no articulatory or phonological deficit, and her comprehension of both spoken and written words was preserved.

SM grew up in France within a French/Italian bilingual family. She further learned English at school from the age of 15 years. She reported that, before her stroke, she was as proficient in English as in French. In fact, she spoke English on a daily basis at work (she taught in English at an international school).

Experimental study

Method

Spoken word comprehension and production in French (L1) and English (L2) were assessed with a word–picture verification and a picture naming task including the same set of items. The target words were 60 French words and their 60 corresponding English words, closely matched for number of phonemes and word frequency (taken from the LEXIQUE and CELEX data base, for French and English, respectively). Half of the L1 and the L2 words were cognates and half were non-cognates.

SM was also presented with a translation task in both directions, including 80 words, among which 48 were also used in the word–picture verification and the naming task. The 80 French and 80 English words were closely matched for number of phonemes, word frequency, and cognate status. The translation task was presented within an ABBA design, half of the words having to be translated first from L1 to L2 and the other half first from L2 to L1.

Results and discussion

- In L1, SM scored 54/60 in the word–picture verification task and 39/60 in the picture naming task (most of her erroneous responses in naming were semantic paraphasias). This pattern suggests that spoken word recognition processes and lexico-semantic representations are relatively preserved and that SM's impaired performance in naming probably arose from a deficit in retrieving the output word form representations.
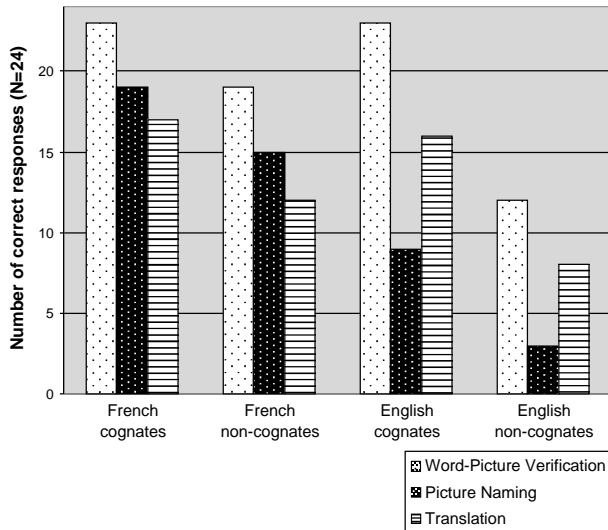
Fig. 1. SM's performance in word–picture verification, picture naming, and translation in French (L1) and English (L2) for cognates and non-cognates.

- In L2, SM's performance in the word–picture verification task (43/60) and in the naming task (13/60) was significantly poorer than in L1 [t (118) = 2.60, $p < .01$] and [t (118) = 5.28, $p < .001$]. Assuming that the lexico-semantic system is common to both languages, this pattern would suggest that, contrary to L1, spoken word recognition and/or access to lexico-semantic representations from spoken words were impaired in L2 and that, like in L1 but more severely, the retrieval of L2 output word forms was impaired too.
- In both L1 and L2 and in both tasks, SM's performance for cognates was significantly better than for non-cognates. Thus, in L1 wordpicture verification, she scored 29/30 and 25/30 for cognates and non-cognates, respectively, and, in L1 picture naming, she scored 23/30 and 16/30 for cognates and non-cognates (main effect of cognate status: F (116) = 6.51, $p = .012$; n.s. interaction). In L2 wordpicture verification, she scored 29/30 and 14/30 for cognates and non-cognates and, in L2 picture naming, 10/30 and 3/30 (main effect of cognate status: F (116) = 4.03, $p < .001$; n.s. interaction).

This pattern suggests that the representation of cognates within the bilingual lexicon is more resilient to brain damage than that of non-cognates.

- SM's performance in naming and translation was compared by considering only the 48 items presented in both tasks (see Fig. 1). The interesting results concern SM's performance in L2, which was significantly better in translation than naming [F (92) = 7.29, $p < .01$]. Her performance was also significantly better for cognates than non-cognates [F (92) = 9.93, $p < .01$], but no significant interaction between task and cognate status was noted [F (92) = 0.20, $p = .65$]. That SM retrieved more accurately L2 output word forms in translation than in naming strongly suggests the existence of a direct processing route linking L1 input word forms to L2 output word forms, that is, a route specifically involved in the translation from L1 to L2. This route would be relatively spared in SM in comparison with the semantic route for translating from L1 to L2, which was severely impaired, as revealed by her performance in L2 picture naming.

Conclusion

SM's pattern of performance in naming and translation provides constraints to theories of the bilingual lexical processing system. First, such theories should be able to account for the finding that the lexical representation of cognates is more resilient to brain damage than that of non-cognates. Second, a processing route directly linking L1 input word forms to L2 output word forms should be assumed to be involved in translating both cognate and non-cognate words.

References

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