

A Critical Review and Assessment of the Revised Hierarchical Model

CHEN Hui

University of Shanghai for Science and Technology, Shanghai, China

The growing number of multilingual speakers poses an interesting question as to the way in which three or more languages are represented in the memory of a language user. The Revised Hierarchical Model (RHM) skillfully captures the prediction regarding two languages, with the lexical level being separate and the conceptual one being unified or distributed to a varying degree.

Keywords: bilingual processing, the Revised Hierarchical Model, lexical level, conceptual level

Introduction

With the deepening of globalization, the ability to learn a second or even third language has become increasingly important than ever before. The increasing representation of bilingual students in China calls for more information on the normative course of bilingual language development. One domain of language that shows the greatest growth in school-age children is vocabulary. A rich vocabulary is essential for smooth and functional communication. During the school years, children are increasingly called upon to yield word definitions and to use words in various oral and written discourses. These academic tasks require deep knowledge of words, such as categorical and functional information, grammatical class information, and knowledge of morphological variations of words and of the sociolinguistic contexts of word usage. Despite the importance of deep vocabulary knowledge, how words from a second language become inter-connected with the first language remains unresolved. The organization of a bilingual's two languages has been a major focus of psycholinguistic research over the past few decades.

Hierarchical Models

Hierarchical models of language processing draw a distinction between the lexical and conceptual levels of representation. For the late bilingual, it is widely believed that translation equivalents are divided at the lexical level, but the two lexicons share a common conceptual system (Kroll & Stewart, 1994). Debate has largely centered on the nature of the interconnections between these different levels of representation. Therefore, two possibilities were proposed: (1) the word association model, which predicts that the second language lexical representation is only indirectly linked to the conceptual store via a lexical level link with its translation equivalent in the first language, and (2) the concept mediation model, which assumes that both the first language and the second language representation have direct links to the conceptual store (Potter, So, Von Eckardt, & Feldman, 1984). Early research seemed to support both of these models to a certain extent. More specifically,

CHEN Hui, M.A., College of Foreign Languages, University of Shanghai for Science and Technology, Shanghai, China.

there appears to be a developmental shift, from word association, to concept mediation, which occurs as the speaker becomes increasingly proficient in their second language (Chen & Leung, 1989).

The Revised Hierarchical Model

Kroll and Stewart (1994) subsequently attempted to capture this quality of bilingual language processing in their proposal of the Revised Hierarchical Model (RHM), and this model was explicitly developed to explain asymmetries in translation performance by late and L1-dominant bilinguals. The model proposes that the two languages share the same conceptual system. According to the RHM, when a person acquires a second language, strong links have already been established between the first language word forms and his concepts. Words of the second language are attached to the system by lexical links to the translation equivalents of the first language, so that access to the meaning of second language words is mediated by first language. Translation from second language to first language is accomplished through direct lexical links, while first language to second language translation necessarily relies on conceptually mediated links because there are no direct links between first language and second language word forms. Therefore, translation from first language to second language is much slower than that from second language to first language.

However, as the speaker becomes more proficient in their second language, a direct link eventually forms between second language and the conceptual system, which parallels the established link between first language and the conceptual system. The link gradually strengthens, and the lexical links to first language translation equivalents become correspondingly weaker. The additional lexical link formed from the first language to the second language remains weak in comparison to the initial link from the second language to the first language. A fluent bilingual will possess an asymmetrically connected linguistic system in which the two lexicons are linked both directly at the lexical level, and indirectly via independent links between each lexicon and the conceptual store. A consequence of these structural asymmetries is that backward translation (L2-L1) is predicted to be faster and more reliable than forward translation (L1-L2), since it is more likely to occur via the direct lexical pathway. However, what would be expected is that forward translation in contrast occurs more slowly via the indirect, conceptually mediated route.

Since its inception, the RHM has been the focus of numerous studies examining various aspects of the model, such as the asymmetry between first language and second language processing, the consequence of language learning history for lexical processing (the developmental hypothesis), and the common conceptual system assumption. These studies have employed a number of experimental paradigms (e.g., translation, picture naming, list recall, brainstorming, and lexical decision) and addressed various phenomena, such as cross-language priming or interference, cognate advantage in early phases of second language learning, and frequency and outcomes of code switching. Although the utility of this model has recently been under scrutiny, it remains one of the most influential and current models of bilingual memory (Brysbaert & Duyck, 2010).

Discussion

The RHM has been supported primarily by two key empirical observations. First, bilinguals seem able to translate more quickly from L2 to L1 than from L1 to L2 (Kroll & Stewart, 1994; Tokowicz & Kroll, 2007). Second, conceptual factors have been reported to influence forward translation but not backward translation (e.g.,

Kroll & Stewart, 1994). For example, Kroll and Stewart (1994) demonstrated that when word lists are organized, so that words from the same semantic category are presented together, bilinguals require more time to translate them into their second language than they do when word lists are semantically mixed. In contrast, when the same bilinguals are required to translate second language words into first language, translation speed is unaffected by the semantic categorization of the list.

Nevertheless, other researchers have produced contradictory results; the assumptions of the RHM remain highly controversial. De Groot and Poot (1997), for example, observed no reliable differences between the speed of forward and backward translation in fluent bilinguals and less proficient bilinguals were in fact faster at forward translation, which directly contradicts the assumptions of the RHM. Furthermore, several authors have argued that conceptual factors can influence backward as well as forward translation (Vigliocco, Lauer, Damian, & Levelt, 2002). Given that majority of studies testing the assumptions of the RHM have only used concrete nouns as stimuli, the possibility that the RHM only holds for concrete words, and abstract words are processed in an entirely different manner, cannot be excluded. For example, because they are less likely to have a one-to-one translation, it is possible that abstract words will always be conceptually mediated regardless of translation direction, whereas concrete words with a single translation are not. Numerous other factors which are highly correlated with concreteness may also impact the speed at which words are translated. For example, concrete words tend to be learned earlier on during the L2 acquisition process, and thus may simply have more robust lexical representations in memory. In addition, although the RHM can potentially account for much of the evidence on translation priming asymmetry, it cannot explain why the magnitude of the asymmetry should differ between semantic categorization and lexical decision tasks. The assumptions regarding the common conceptual store do not allow for storage of language or culture specific concepts, which for instance can be took as a major flaw in the model. Brysbaert and Duyck (2010) extend their criticism of the framework by questioning the proposition regarding the separate lexicons, language selective access, or the strength of the connections between second language and concepts and conclude that “Is it time to leave behind the Revised Hierarchical Model of bilingual language processing after fifteen years of service” (p. 359). One limitation of the RHM framework acknowledged by Kroll et al. is its assumption that L2-concept links are bidirectional, therefore, equally weak in both directions. They argue that evidence suggests that this link is, in fact, asymmetrical, “in the sense that access from words to concepts may be accomplished easily ... [while] access from concepts to words is more effortful” (Kroll, Van Hell, Tokowicz, & Green, 2010, p. 375).

However, these results have been somewhat inconsistent in nature. For example, although De Groot, Dannenburg, and Van Hell (1994) initially claimed that conceptual memory is involved in backward translation, it was still found to be involved to a lesser extent than during forward translation, a conclusion that can be easily accommodated by the RHM. Three years later, De Groot and Poot (1997) reported that there is no difference in the extent to which conceptual information is involved in forward and backward translation. Kroll et al. (2010) defend the framework by stating that, when the model was first proposed, it did not try to account for lexical non-selectivity and that the claim regarding the weaker link between second language and concepts has been disproved. Kroll and colleagues conceded that the RHM requires a number of revisions due to the new research findings available. As elaborated by Kroll et al. (2010), the RHM’s prediction of lexically mediated L2-L1 translation was specific to non-proficient bilinguals’ performance in translation production tasks. Comprehension tasks, like the

lexical decision and semantic categorization tasks investigated, differ in the nature and time course of cross-language activation. The RHM did not deny the possibility that L2 words can directly retrieve L2 concepts, but proposed that these connections are weaker than those for L1 words. The degree of reliance on that weak link is assumed to be a function of a range of factors, including L2 proficiency, task requirements, and word frequency (Kroll & Tokowicz, 2005).

Conclusions

The RHM (Kroll & Stewart, 1994; Kroll et al., 2010) posits three important assumptions about the bilingual lexicon. First, bilinguals have a single, shared conceptual store, and two separate word-form lexicons for their two languages (L1 and L2). Second, the location, number, and direction of links among the three storage systems vary depending on the individual's first language and second language experience. In the early stage of second language learning, direct links between conceptual representation and the second language lexicon are missing and speakers gain access to concepts through the mediation of the first language lexicon. As learners achieve higher proficiency in the second language, they develop direct links between the second language lexicon and concepts and eliminate the need to mediate through the first language. However, the link between second language words and concepts is weaker than that between first language words and concepts. Third, there are weighted bidirectional links between the first language and second language lexicon with stronger connections from second language to first language words than the reverse. Finally, although the RHM was originally proposed to depict lexical organization in sequential bilinguals, it also takes into consideration the dynamic nature of bilingual proficiency and suggests that shifts in language dominance may result in asymmetric processing in favor of the second language (Kroll et al., 2010).

Estimates suggested that at least half of the world's population are bilingual (French & Jacquet, 2004); therefore, the monolingual language system can no longer be considered prototypical and the progression in multilingual research has fueled over the last 30 years. The RHM had the appealing feature of being a testable model and many citations of Kroll and Stewart's (1994) paper that include a range of studies that have tested the model, extended the model, and applied the model more broadly. Even though the RHM have flaws, it is still considered to be robust and able to account for new findings in the field.

References

- Brysbaert, M., & Duyck, W. (2010). Is it time to leave behind the Revised Hierarchical Model of bilingual language processing after fifteen years of service? *Bilingualism: Language and Cognition*, 13(3), 359-371.
- Chen, H. C., & Leung, Y. S. (1989). Patterns of lexical processing in a nonnative language. *Journal of Experimental Psychology-Learning Memory and Cognition*, 15(2), 316-325.
- De Groot, A. M. B., Dannenburg, L., & Van Hell, J. G. (1994). Forward and backward word translation by bilinguals. *Journal of Memory and Language*, 33(5), 600-629.
- De Groot, A. M. B., & Poot, R. (1997). Word translation at three levels of proficiency in a second language: The ubiquitous involvement of conceptual memory. *Language Learning*, 47(2), 215-264.
- French, R. M., & Jacquet, M. (2004). Understanding bilingual memory: Models and data. *Trends in Cognitive Sciences*, 8(2), 87-93.
- Kroll, J. F., & Tokowicz, N. (2005). Models of bilingual representation and processing: Looking back and to the future. In J. F. Kroll and A. M. B. De Groot (Eds.), *Handbook of bilingualism: Psycholinguistic approaches* (pp. 531-553). New York: Oxford University Press.
- Kroll, J. F., & Stewart, E. (1994). Category interference in translation and picture naming—Evidence for asymmetric connections between bilingual memory representations. *Journal of Memory and Language*, 33(2), 149-174.

- Kroll, J. F., Van Hell, J. G., Tokowicz, N., & Green, D. W. (2010). The Revised Hierarchical Model: A critical review and assessment. *Bilingualism: Language and Cognition*, 13, 373-381.
- Potter, M. C., So, K. F., Von Eckardt, B., & Feldman, L. B. (1984). Lexical and conceptual representation in beginning and proficient bilinguals. *Journal of Verbal Learning and Verbal Behavior*, 23(1), 23-38.
- Tokowicz, N., & Kroll, J. F. (2007). Number of meanings and concreteness: Consequences of ambiguity within and across languages. *Language and Cognitive Processes*, 22(5), 727-779.
- Vigliocco, G., Lauer, M., Damian, M. F., & Levelt, W. J. M. (2002). Semantic and syntactic forces in noun phrase production. *Journal of Experimental Psychology-Learning Memory and Cognition*, 28(1), 46-58.