

L1 Role in Bilinguals' Mental Lexicon: A Comparative Study between Chinese-English and Alphabetic Bilinguals*

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Abstract—This study is to compare L1 (first language) roles between Chinese-English and alphabetic bilinguals' mental lexicons through reviewing empirical studies. L1 lexicon plays an important role in L2 (second language) processing in two aspects for alphabetic bilinguals, automatic activation of similar L1 to sensory input of L2, and that of L1 translation equivalent. While for Chinese English learners, L1 lexicon basically influences L2 by equivalent activation only, and the effect may persist throughout their lives, which is dramatically different from the developmental pattern of alphabetic bilinguals. The differences may come from different typological distance between the two languages, different composition of L2 mental lexicon, and their unique English acquisition experience in China.

Index Terms—L1 role, Chinese EFL learner, mental lexicon, comparative study

I. INTRODUCTION

Bilingual mental lexicon has been a hot topic for these decades. Researchers are keen on understanding how foreign words are integrated into the brain and hardwired with the pre-existing mother tongue. However, L2 (second language) lexicon can never be treated and studied as an independent system, at least independent of the pre-existing L1 (first language) word. The present study will explore the L1 role in the bilingual mental lexicon, i.e. how L1 words exert influence on L2 processing in Chinese-English and alphabetic bilinguals, following the Saussurian principle of distinguishing between form and meaning or orthographic/phonologic–semantic organization at the level of individual words (de Saussure, 1972).

There are two different viewpoints in terms of L1 role in L2 reading. One is selectivity, which is that the two languages of bilinguals are activated selectively, in other words, only the target language, e.g., the second language, is activated and accessed when reading this language, and L1 does not play a role in L2 processing. While the other view is non-selectivity. Based on the review on the large body of empirical studies, a majority of researchers intend to believe that languages of bilinguals, target or non-target, are activated non-selectively and parallelly. To be specific, L1 words will be inevitably activated during L2 processing.

II. L1 ROLE IN ALPHABETIC BILINGUALS' MENTAL LEXICON

Despite task design (lexical recognition or production) and input modality (visual or auditory), L1 exerts influence on L2 processing at both phonological and orthographic levels. In the visual modality, for phonology, masked phonological priming revealed interlingual homophone priming effects from the L1 to L2, just like that from the L2 to L1 (e.g. Brysbaert, Van Duyck, & Van de Poel, 1999; Van Wijnendaele & Brysbaert, 2002). The magnitude of cross-language priming was not significantly different from that of priming within a single language. For orthography, there was an interference effect of L1 on L2, affected by orthographic density across the languages (the number of words which are similar in spelling but different by a grapheme) and word frequency (Jared & Kroll, 2001; Van Heuven et al., 1998), i.e., words of cross-linguistic high frequency and with more cross-linguistic orthographic neighbors in the L1 slowed responses to target words in the L2, the size of which was modulated by L2 proficiency, greater for L2 proficient bilinguals (Bijeljac-Babic, Biardeau, and Grainger, 1997). Besides word recognition, L1 orthographic input was also reported to influence bilingual language production. Hermans, Bongaerts, De Bot, and Schreuder (1998) found that bilinguals could not suppress L1 lexical information when naming pictures in an L2 in a picture-word interference task. Words could prime those of similar phonology and orthography in spoken word recognition (e.g. Slowiaczek et al., 2003). However, simultaneous activation occurred more reliably in learners of high proficiency than low proficiency (Jared & Kroll, 2001; Silverberg & Samuel, 2004). Findings of parallel L1 activation during L2 processing had been consistent and L1 activation was so stable that it can be observed even in its absence during L2 processing (Sunderman

* This research is supported by 2016 Fundamental Research Funds for the Central Universities (中央高校基本科研业务费基金, No.2242016S20021) and 2015 Teaching Reform and Research Fund of Southeast University (2015 年东南大学教学改革与研究项目)

and Kroll, 2006).

Both L1 facilitatory effect in phonology and inhibitory effect in orthography on L2, similar to those obtained within the same language, were highly suggestive of integration of L2 phonological and orthographic lexicons into corresponding L1 ones. Studies reviewed above unexceptionally used alphabetic bilinguals whose two languages were close in typology. When they acquire a new word in the second language, not only the semantics but also phonology and orthography can be well imbedded in the corresponding preexisting L1 lexicons, forming a common area for the most part and a small part of L2-specific area, whose sizes depend on the typological distance between the two languages. The degree of L1 effect might also vary as a function of L2 proficiency, as well as input modality, similarity of L2 sensory input to L1 phonology or orthography, etc.

Besides nonselective activation of L1 neighbor words during L2 processing, L1 role is complicated by automatic activation of L1 equivalents. According to Revised Hierarchical Model (RHM) (Kroll, 1994), when EFL (English as a Foreign Language) learners acquire a new L2 word, this word develops links to both L1 form and meaning, and can be accessed via either orthographic or semantic routes, depending on L2 proficiency. However, to what extent L1 influences L2 reading is still an unanswered question, because of opposite results of presence or absence of L1 translation activation during L2 processing. The rationale of these studies is that if L1 words are activated during L2 processing, it suggests L1 and L2 are lexically associated and the L2 words are accessed through L1 equivalent. If L1 words are not involved during the process, it suggests that the common concept can be directly accessed and L2 and L1 are conceptually linked, L1 lexical information bypassed.

Findings of numerous empirical studies using alphabetic bilinguals on L1 equivalents involvement have supported RHM to a large extent. L1 translation is able to mediate L2 reading, according to some studies, for example, Talamas et al.'s (1999). In their study, translation-recognition task was used to test the performance of English speakers of different Spanish proficiency. Subjects were asked to judge if the second word was the equivalent of the first. The paradigm of this experiment was that the critical trials were those which were not translation equivalents but lexically (e.g., *man-hambre* "hunger") or semantically (e.g., *man-mujer* "woman") related word pairs and subjects' response should be "no". Talamas et al. reported that low-proficiency bilinguals responded to the L2 form distractors more slowly compared with the meaning distractors, whereas more proficient bilinguals were more slowly in response to meaning distractors compared with form distractors. The overall outcome was basically in line with RHM hypothesis, in that lexical relations between the two languages dominated the linking pattern of early L2 learners, while semantic relations dominated that of highly proficient L2 learners.

However, there were also a large number of studies of null activation of L1 translation equivalents. Quite a number of studies reported results that bilinguals could access L2 conceptually, without L1 activation (e.g., De Groot, Dannenburg, & Van Hell, 1994; Zeelenberg & Pecher, 2003; La Heij et al., 1996). What these experiments had in common was that all researchers used highly proficient L2 subjects. Nevertheless, it was still unclear when learners became able to directly access concept correspondent to the L2 words. Some studies claimed that the ability to do so could emerge quite early in learning (e.g., De Groot & Poot, 1997; Altarriba & Mathis, 1997; Potter, So, Von Eckardt, & Feldman, 1984; Frenck-Mestre & Prince, 1997), while others suggested that this ability developed in different stages (e.g., Dufour & Kroll, 1995; Talamas et al., 1999). No matter at what point learners turn to change L2 processing pattern from lexical to conceptual access, L1 equivalent role is basically modulated by L2 proficiency level.

III. L1 ROLE IN CHINESE-ENGLISH BILINGUALS' MENTAL LEXICON

Chinese EFL learners are not as lucky as the alphabetic bilinguals, as Chinese and English are by no means similar in typology. Chinese characters are logographic and monosyllabic, sharing no similar orthographic or phonologic features with English. They even differ in semantics or to a larger extent than any two alphabetic languages. Therefore, their formal lexical representations are definitely separate.

Though L1 role in Chinese-English bilinguals' mental lexicon and L2 access routes can also be described by Revised Hierarchical Model (RHM) (Kroll & Stewart, 1994), findings with these subjects are somewhat inconsistent with those in line with RHM with alphabetic bilinguals in the proficiency effect. For example, in Guo *et al.*'s (2012) study (experiment 1), they studied reading mechanism of highly proficient Chinese-English bilinguals who had immersed in an English-speaking environment for years. The stimuli were Chinese and English word pairs, whose relationship between was manipulated such that the critical trials consisted of Chinese words that were not translation equivalents but were related in meaning or in lexical form similarity (i.e., orthographically and/or phonologically) to the correct translation of the English words. Behavioral measures of response time and accuracy revealed interference for both distracter types. Furthermore, similar magnitudes of semantic and lexical interference effects were observed in these proficient bilinguals. The findings indicate that in highly proficient Chinese English learners, L1 equivalent is still activated during L2 reading. Thierry *et al.*'s (2007) study was in the same line. Chinese-English participants were supposed to judge if the two English words presented in pairs were semantically related or not in the study. Half of the words contained a character repetition when translated into Chinese, which subjects were unaware of. Although reaction time was not influenced by the hidden factor, brain potentials were obviously modulated in the hypothesized direction, that is, English words were unconsciously and automatically translated into Chinese equivalents. More interestingly, the same pattern was observed in Chinese monolinguals when they read the repeated Chinese words. Finally, this pattern of

outcome was replicated in the auditory mode by using a listening comprehension task. Their results demonstrated that L1 activation was spontaneous and inevitable mechanism of L2 comprehension in Chinese EFL learners, even in the absence of Chinese.

IV. MECHANISMS OF THE DIFFERENCE

The differences in L1 role during L2 processing between the two types of bilinguals may come from the different organization patterns of the mental lexicon. L2 representation and processing of Alphabetic bilinguals can be well explained by *Distributed Conceptual Feature Model* (DCFM) (Kroll and de Groot, 1997; de Groot, Dannenburg, & van Hell, 1994; de Groot, 1992) (figure 1) and Bilingual Interactive Activation (BIA) series (Dijkstra and Van Heuven, 1998; 2002) (figure 2). The strength of DCFM was that such lexical variable effects as concreteness effect was highly explainable in its framework. In this model, lexical nodes of both languages are related with a distributed set of conceptual features, opposite to conceptual representations in localism. As described by the DCFM, L1 and L2 meanings overlap in conceptual features to varying extent depending on different types of words that were represented. L1 role during L2 reading depends on the extent of the featural overlap. For example, L2 words sharing more common conceptual features with L1, like concrete nouns, are easier to be recognized. BIA series (BIA, BIA+, BIA++) is very popular and of high explanation power in bilingual processing because it highlights recognition of alphabetic orthography. The mechanisms of word recognition of this modal are basically activation of the relevant information and inhibition of the irrelevant. When a bunch of letters are presented, the visual information stimulates features at each letter position, which then activates letters containing these features and simultaneously inhibits letters without these features. Activated letters then excite words in both languages, while all other irrelevant words in the neighborhood are inhibited. At the word level, mutual inhibition occurs between all words, regardless of the language to which they belong. Activation of word level is passed on to the corresponding language node on the same side, which in turn sends inhibitory feedback to word nodes in the other language. The nodes at the language level collected activation from words in this language they represented and inhibited activated words of the other language. The whole process of recognizing a word in a bilingual can be described as activation of all relevant letters and words and inhibition of irrelevant ones due to feedback from the language node. Despite the different foci and strengths of each model, what these two models share in common is that they were developed exclusively for alphabetic bilinguals, whose lexeme and lemma of both languages are represented and integrated to a large extent in the brain.

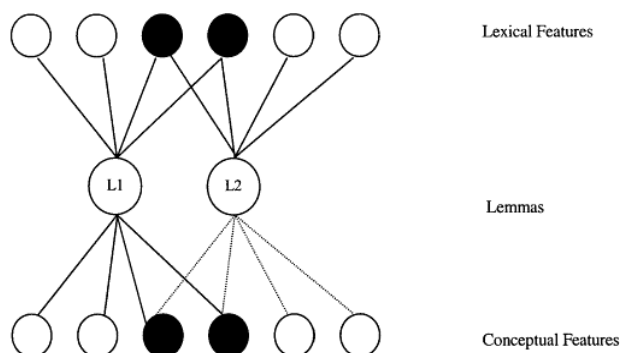


Figure 1: The Distributed Lexical/Conceptual Feature Model (DCFM) (adapted from Kroll and de Groot, 1997)

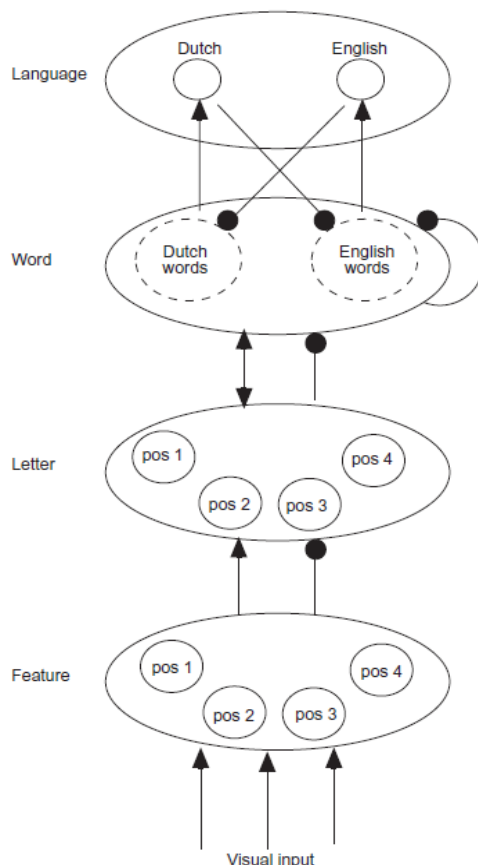


Figure 2: BIA (Ton Dijkstra & Van Heuven, 2002)

However, Chinese-English bilinguals' mental lexicon is best described in Nan Jiang's Three-stage Hypothesis (2000). First of all, Chinese and English lexemes must be represented separately. Second, L2 vocabulary acquisition is seen as consisting of three stages, as is shown in the figure 3 and 4 below: the formal stage when a lexical entry is set up with formal features, the L1 lemma mediation stage when the L2 lexical entry borrows the lemma information of the L1, mediating L2 word processing, and the L2 integration stage when semantic, syntactic, morphological specifications were integrated into the lexical entry. Jiang (2000) also argued that a majority of L2 words would fossilize at stage two because of the practical constraints imposed on L2 learning, namely, the instruction settings instead of communicative settings. Thus, generally lexical representation of Chinese-English bilinguals have three unique features. First, a lexical entry is composed of L2 lexeme and L1 lemma; second, the entry does not have adequate morphological specifications; and third, L2 words are weakly linked with concepts.

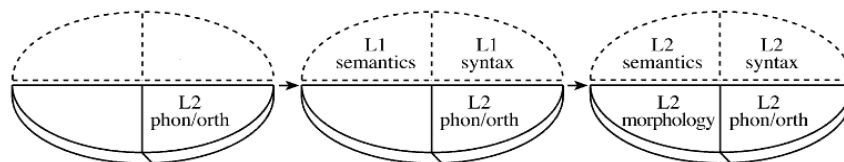


Figure 3: Development in L2 Lexical Representation: From Stage 1 to Stage 3 (Nan Jiang, 2000)

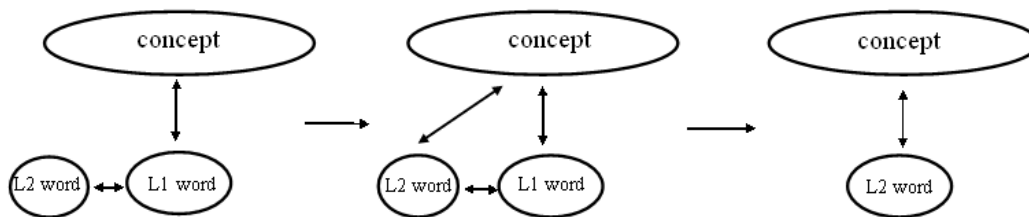


Figure 4: Development in L2 Lexical Processing: From Stage One to Stage Three (Adapted from Nan Jiang, 2000)

Although 3-stage hypothesis does not specifically mention the role of L1 lexeme when simulating the composition of the L2 mental lexicon, it does highlight the role of L1 word when L2 words are processed at the first two stages. At stage one, L2 words can only be accessed via L1 words, and at the next stage, L2 words can be accessed via two routes, the conceptual link between L2 form and the concept and lexical link associated with L1 words. Theoretically, any learner and any word can reach the third stage if sufficient and highly contextualized L2 input is available and processed by the learners. Unfortunately, L2 lexical development may fossilize at stage 2 and will never proceed to stage 3 due to the long-term use of L1 lemma (Jiang, 2000).

Besides the distinct typology of the two languages and the different representation of the bilingual mental lexicon, the differences between the Chinese-English and alphabetic bilinguals may also be very likely to come from practical constraints, i.e., English teaching methodology throughout the subjects' learning experience in China. As far as is known, the teaching method that is most frequently used in their high school and the time before is grammar-translation teaching, where translation equivalents are often used to illustrate or clarify an L2 word. Chinese translation equivalents are often taught as direct word-to-word mapping, which does not encourage additional meaning to be acquired.

In the instruction setting, such sentences as the followings are often produced despite L2 proficiency level, which can be good evidence of the unique representation of Chinese bilingual mental lexicon and consequences of grammar-translation teaching. The italicized sentences are the examples of inappropriate utterances in productive language tasks observed in Chinese EFL learners.

Example 1:

1) I want to study law.

2) *I /want to /read /law school.*

3) 我/ 想 /读 / 法律学院。

Example 2:

1) I studied medicine in order to take care of my parents' health.

2).....*take care of /my parents' /bodies.*

3)..... 照顾 / 父母 / 身体。

The italicized sentences (sentence 2) in example 1 and 2 were what college students spontaneously produced for classroom tasks, and sentence 1)s were what they actually meant. They uttered "read law school" instead of "study law" presumably because "read" and "law school" were the translation equivalents of "读" and "法律学院" respectively, which were very native and high frequency verb-object collocation in Chinese. The same was true with example 2. "bodies" was uttered because it was the two-way translation of "身体" in Chinese. Sentence 1)s were conceptually linked to sentence 3)s, while sentence 2)s were lexically linked to them. The spontaneous output of lexically linked English sentences highly suggested the lexical links might not have totally disappeared, and perhaps even outweighed the semantic links, if there were these links. It may be argued that these students were just at a lower stage in the developmental continuum, but they were in the third year at the college of medicine, with relatively high level assessed by English proficiency tests like TOFEL. Therefore, just as 3-stage hypothesis predicts, fossilization occurs in Chinese-English bilinguals due to the long-term use of L1 lemma, the unique composition of L2 lexicon and special language learning experience.

Grammar-translation is the most efficient way to help students to be a good test taker. There is indeed evidence for the effectiveness and efficiency of this teaching method. Altarriba and Knickerbocker (2011:21-48) reported three methods, translation equivalent teaching, black and white picture teaching, and color picture teaching, lead to similar learning effect, and translation equivalent teaching is superior to two others in L2 word teaching as it leads to the fastest performance. However, as is shown in the present study, unlike alphabetic bilinguals, L1 influence and involvement in L2 processing does not disappear with proficiency. Their L1 reliance is overwhelmingly significant, and L2 concept is not able to be sufficiently established and in use. What's worse, before university, English is taught via Chinese, as Chinese is the major classroom language. Therefore, English language is likely to be learned as explicit knowledge instead of implicit knowledge that any skills should be represented as. So English teaching methodology may be the other significant factor that leads to the unique feature of the organization and processing of Chinese-English mental lexicon.

V. PEDAGOGICAL IMPLICATIONS

The first pedagogical implication is that establishment of L2 lemma in L2 lexicon and L2 access directly via concept is the ultimate processing pattern for an EFL learner. Chinese EFL learners' L2 lexicon is unique, different from other alphabetic bilinguals. It means there are more difficulties for Chinese learners in the attainment of the same high proficiency as alphabetic bilinguals, as the Chinese subjects recruited to the studies of the Chinese-American scientists reviewed above have the highest English proficiency in almost all Chinese learners. Only by replacement of L1 lemma by L2 lemma, can it be possible for the bilinguals to move closer to the nativeness in L2 processing. So maturity of semantic/syntactic network can be another indicator of real proficiency, instead of proficiency test result only.

Second, there are not always one-to-one translation relations between the two languages. The availability of multiple translations relates to the issue of linguistic relativity in that thoughts may be different for bilinguals when labels vary

across their languages. Thoughts may be different in L1 and L2, if lexical forms are so distant across languages. The process of linking semantics for a better alignment with the form of a second language is thought to require more extensive exposure and practice to the second language. Therefore, understanding subtle differences in meaning and L2 concept refinement in teaching is needed throughout the process of L2 learning.

Finally, L1 inhibition should be the theme of the L2 class, as automatic L1 activation can still be observed in high-proficiency learners. It can be assumed that these EFL learners have a difficult time controlling the cross-linguistic competition. As English teachers, it is necessary to be aware of the unintentional activation of L1 and cross-language competition, and strive to minimize it in terms of teaching methods. These methods that are predicated on notions of L1 inhibition could be conceived for teaching a second language. In a communicative L2 classroom, for example, L1 use is intentionally avoided. English learners in this setting are often asked to think of that classroom as a “little USA or UK”. English teachers, making every effort to simulate this cultural environment, maintain all-English settings in the class at all times. When teaching vocabulary, they use such various techniques as pictures, context, miming, and circumlocution to avoid the L1, in an attempt to develop form-meaning links for L2 learners. L1 use may be a shortcut for the learners to acquire L2 forms and develop lexical links at the form level between the two languages in the very beginning of learning, but it might be detrimental to the learning process in the long run. Therefore, maintaining enough amount of L2 and keeping learners in the L2 mode is critical to link the L2 lexeme to L2 lemma, which is the ultimate stage of L2 learning.

In summary, L1 lexicon plays a role in L2 processing in two aspects for alphabetic bilinguals, automatic activation of similar L1 to sensory input of L2, modulated by lexical variables, such as neighborhood density and frequency on both sides, and that of L1 translation equivalent, modulated by L2 proficiency. While for Chinese English learners, L1 lexicon basically influences L2 by strong lexical link and equivalent activation only, which may persist throughout their lives, despite their L2 proficiency level. The mechanisms of the differences may be typological, psychological and practical.

REFERENCES

- [1] Altarriba, J., & Mathis, K. M. (1997). Conceptual and Lexical Development in Second Language Acquisition. *Journal of Memory and Language*, 36, 550-568.
- [2] Altarriba, J., & Knickerbocker, A. (2011). Acquiring Second Language Vocabulary Through the Use of Images and Words. In Trofimovich & McDonough (Eds.), *Applying Priming Methods to L2 Learning, Teaching and Research: Insights From Psycholinguistics*. Philadelphia: Benjamins, 21-47.
- [3] Bijeljac-Babic, R., Biardeau, A., & Grainger, J. (1997). Masked Orthographic Priming in Bilingual Word Recognition. *Memory & Cognition*, 4, 447-457.
- [4] Brysbaert, M., Van Dyck, G., & Van de Poel, M. (1999). Visual Word Recognition in Bilinguals: Evidence From Masked Phonological Priming. *Journal of Experimental Psychology: Human Perception and Performance*, 25, 137-148.
- [5] De Groot, A. M. B. (1992). Determinants of Word Translation. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 18, 1001-1018.
- [6] 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, 600-629.
- [7] 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, 215-264.
- [8] Dijkstra, T., Van Heuven, W. J. B., & Grainger, J. (1998). Simulating Cross-Language Competition With the Bilingual Interactive Activation Model. *Psychologica Belgica*, 38177-196.
- [9] Dijkstra, A., & Van Heuven, W. J. B. (2002). The Architecture of the Bilingual Word Recognition System: From Identification to Decision. *Bilingualism: Language and Cognition*, 23, 175-197.
- [10] Dufour, R., & Kroll, J. F. (1995). Matching Words to Concepts in Two Language: a Test of the Concept Mediation Model of Bilingual Representation. *Memory & Cognition*, 2, 166-180.
- [11] Frenck-Mestre, C., & Prince, P. (1997). Second Language Autonomy. *Journal of Memory and Language*, 37, 481-501.
- [12] Guo, T., Misra, M., Tam, J. W., & Kroll, J. F. (2012). On the Time Course of Accessing Meaning in a Second Language: An Electrophysiological and Behavioral Investigation of Translation Recognition. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 6, 1-23.
- [13] Hermans, D., Bongaerts, T., De Bot, K., & Schreuder, R. (1998). Producing Words in a Foreign Language: Can Speakers Prevent Interference From Their First Language? *Bilingualism: Language and Cognition*, 1, 213-229.
- [14] Jared, D., & Kroll, J. F. (2001). Do Bilinguals Activate Phonological Representations in One or Both of Their Languages When Naming Word? *Journal of Memory and Language*, 44, 2-31.
- [15] Jiang, Nan. (2000). Lexical Representation and Development in a Second Language. *Applied Linguistics*, 1, 47-77.
- [16] Kroll, J. E., & Stewart, E. (1994). Category Interference in translation and Picture Naming: Evidence for Asymmetric Connections Between Bilingual Memory Representations. *Journal of Memory & Language*, 33, 149-174.
- [17] Kroll, J. F., & de Groot, A. M. B. (1997). Lexical and Conceptual Memory in the Bilingual: Mapping Form to Meaning in Two Languages. In A. M. B. de Groot & J. F. Kroll (Eds.), *Tutorials in bilingualism: Psycholinguistic perspectives*. NJ: Erlbaum, 169-199.
- [18] La Heij, W., Hooglander, A., Kerling, R., & Van der Velden, E. (1996). Nonverbal Context Effects in Forward and Backward Word Translation: Evidence for Concept Mediation. *Journal of Memory and Language*, 35, 648-665.
- [19] Potter, M. C., SO, K.-E., Von Eckhardt, B., & Feldman, L. B. (1984). Lexical and Conceptual Representation in Beginning and More Proficient Bilinguals. *Journal of Verbal Learning & Verbal Behavior*, 23, 23-38.

- [20] Saussure, F. (1972). *De . Cours De Linguistique Generale*. Paris: Payot.
- [21] Silverberg, S. & Samuel, A. G. (2004). The Effect of Age of Second Language Acquisition on the Representation and Processing of Second Language Words. *Journal of Memory and Language*, 3, 381–398.
- [22] Slowiaczek, L. M., Soltano, E. G., Wieting, S. J., & Bishop, K. L. (2003). An Investigation of Phonology and Orthography in Spoken-Word Recognition. *The Quarterly Journal of Experimental Psychology*, 56A, 233-262.
- [23] Sunderman, G., & Kroll, J. F. (2006). First Language Activation During Second Language Lexical Processing: an Investigation of Lexical Form, Meaning, and Grammatical Class. *Studies in Second Language Acquisition*, 28, 387-422.
- [24] Talamas, A., Kroll J. F., & Dufour, R. (1999). From Form to Meaning: Stages in the Acquisition of Second-Language Vocabulary. *Bilingualism: Language and Cognition*, 2, 45-58.
- [25] Thierry, G., & Wu, Yanjing. (2007). Brain Potentials Reveal Unconscious Translation During Foreign-Language Comprehension. *PNAS*, 30, 12530-12535.
- [26] Van Heuven, W. J. B., Dijkstra, T., & Grainger, J. (1998). Orthographic Neighborhood Effects in Bilingual Word Recognition. *Journal of Memory and Language*, 39, 458-483.
- [27] Van Wijnendaele, I., and Brysbaert, M. (2002). Visual Word Recognition in Bilinguals: Phonological Priming from the Second to the First Language. *Journal of Experimental Psychology: Human Perception and Performance*, 28, 616-627.
- [28] Zeelenberg, R., and Pecher, D. (2003). Evidence for Long-Term Cross-Language Repetition Priming in Conceptual Implicit Memory Tasks. *Journal of Memory and Language*, 1, 80–94.

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