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A Psycholinguistic Account of L1 Lexical Transfer in L2 Production

Abstract: In its development for more than five decades, numerous empirical language transfer studies have obtained many solid findings in L2 production; however, these findings often concern linguistic expressions but lack deep psycholinguistic explorations. Focusing on lexical transfer, this paper intends to provide a psycholinguistic explanation for the accumulated findings about L1 lexical transfer including conceptual, lemma and lexeme levels. This is achieved through a postulation of a psycholinguistic model of L2 production based on previous studies of bilingual representation, activation and production. Applying this model, it is suggested that the occurrence of many types of lexical transfer can be accounted for by the interaction between bilingual representation and executive control.

Keywords: bilingualism; executive control; L2 production; lexical transfer

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1 Introduction

In the field of language transfer (or crosslinguistic influence), many manifestations of how L1 shows an impact on L2 vocabulary and grammar have been documented. Compared with grammar, words, as building blocks of a language, deserve and have received more attention (e.g. Adjemian 1983, Arabski 2006, Brooks et al. 2011, Jarvis 2009, Jiang 2000, 2002, 2004a, 2004b). Words, though seemingly simple, have much richer content than we usually assume. Ringbom (1987: 37) holds that there are seven dimensions of word knowledge: (1) accessibility — the ability to access a word in one's mental lexicon, (2) morphophonology — knowledge of how the word is pronounced and spelled in its various forms, (3) syntax — knowledge of the word's grammatical class and syntactic constraints, (4) semantics — knowledge of the meaning(s) of the word, (5) collocation — knowledge of the multiword combinations in which the word conventionally occurs, (6)

association — knowledge of the word's associations with other words and notions, and (7) mental concepts with which a word is associated. Logically and empirically, L1 transfer can occur on all of the above dimensions (Arabski 2006, Jarvis and Pavlenko 2008, Odlin 1989, Ringbom 1987, 2007), though not necessarily to the same extent. In this sense, lexical transfer is broadly defined as "the influence of word knowledge in one language on a person's knowledge or use of words in another language" (Jarvis and Pavlenko 2008: 72).

Lexical transfer plays an important role in both production and comprehension, but the former has received much more attention, partly because expressing oneself is the ultimate goal for most L2 learners and partly because production is more visible and tangible. Therefore, demonstrations of lexical transfer in L2 production has been reviewed and summarized in some monographs and papers. However, description is insufficient for scientific research, whose final goal is to explain the phenomena and predict future development. The same principle applies to language transfer research. Among its four phases, the last one is to develop a precise physiological account of how the phenomenon takes place in the human brain (Jarvis and Pavlenko 2008: 6). Following this line of inquiry, I aim to propose a psycholinguistic model and apply it to explain the documented lexical transfer on conceptual, lemmatic and lexeme levels.

2 Main Findings in Lexical Transfer Research

This part summarizes some main findings concerning L1 lexical transfer, particularly in L2 production based on previous reviews, observations and empirical studies.

1) As the strong version of the Contrastive Analysis Hypothesis suggests, those elements (including but not limited to vocabulary) that are similar to one's native language are simple for a learner, and those elements that are different pose problems (Lado 1957, Wardhaugh 1970). While the former part of this view has been confirmed (Ringbom 1987, 2007) due to positive transfer, the latter part of it has been proved not necessarily to be correct. Instead, obvious differences often make target language structures easy to learn (Jarvis and Pavlenko 2008: 11).

2) Transfer effects have been noted on both formal (phonological and morphological) and semantic levels. Formal transfer is more likely to occur

when the source and recipient languages are closely related, whereas semantic transfer is more likely to occur when the source language and recipient languages are typologically distant. (Jarvis and Pavlenko 2008: 12, 75–82) for example, Biskup (1992: 91) found that German students tended to produce errors resulting from assumed formal similarity as German and English are closely related, but Polish students' errors reflect assumed semantic similarity instead because there is not much formal similarity between Polish and English. Formal transfer in most or all instances arises as the result of similarities that the language user has observed (or perceived, though often incorrectly) between the source and recipient languages, whereas semantic transfer can occur regardless of observed similarities and often even in the face of observable differences (Ringbom 1987, 2007).

3) With regard to word choice transfer from a specific approach, it is found that the choice of a specific word in a specific context is indeed often motivated by a corresponding L1 preference (Jarvis and Pavlenko 2008: 89). When one L1 word corresponds to one L2 word, it is considerably easy to learn and use this L2 word because the L2 word can exert a positive influence. Nevertheless, if one L1 word has two or more near translation equivalents in L2, a bilingual often feels confused and tends to choose the one he is most familiar with (see Cai 2013).

4) In the case of morphological transfer (see Jarvis and Pavlenko 2008: 92–96 and Odlin 2006 for a summary), bound morphemes, once treated immune to transfer, has been proved to frequently occur, especially when the source and target languages are lexically and morphologically related (e.g. De Angelis and Selinker 2001, Hancin-Bhatt and Nagy 1994, Jarvis and Odlin 2000), let alone free morphemes (like articles or prepositions in English), which have received more attention (for articles see Jarvis 2002, Master 1997, for prepositions see Ijaz 1986, Lowie and Verspoor 2004).

5) Many cases of increasing studies on syntactic transfer can also be regarded as lexical transfer because the syntactic specifications of some words are copied from one language to the other. Among them, verbs have received much more attention and provided more evidence for lexical transfer (e.g. Adjémian 1983, Helms-Park 2001, Pavlenko and Driagina 2007).

6) Those studies concerning collocational transfer (e.g. Biskup 1992, Hasselgren 1994, Lesniewska 2006, Wei 2014, Wolter and Gyllstad 2011, Yamashita and Jiang 2010) have documented a great number of instances of collocational transfer and confirmed that the lemma-lemma associations in learners'' L1s are indeed often carried over to the corresponding lemmas in the L2 (Jarvis 2009: 116). In terms of the words constituting the collocations

in L1 and L2, they can be divided into at least three types, namely L1-L2 congruent, L1-L2 incongruent, and L2 only collocations. The existing evidence from production and comprehension studies suggests that the congruent collocations are easiest to learn due to the aiding role of L1 (Wei 2014, Wolter and Gyllstad 2011, Yamashita and Jiang 2010). However, it is noted by Wolter and Gyllstad (2011) that learners sometimes reject acceptable L2 collocations even when they have an equivalent form in the L1 (Kellerman 1979, Lesniewska and Witalisz 2007). Regarding the negative L1 influence, varying degree and different types of transfer have been reported. For example, Nesselhauf (2005) found 50% of errors were attributed to L1 influence. Laufer and Waldman (2011) found Hebrew learners made higher percentages of L1-based errors in producing verb-noun collocations with the improvement of L2 English proficiency, namely 44% in the basic group, 63% in the intermediate group, and 64.5% in the advanced group. However, no significant relationship was found between learner proficiency and the number of collocations potentially reflecting L1 influence. Biskup (1992) noticed that the errors made by the Polish learners involved loan translation or semantic extension of L2 words reflecting an assumed similarity between Polish and English, whereas the German learners produced many errors ascribable to German words, reflecting an assumed formal similarity.

7) With the rapid development in conceptual transfer research (see Jarvis 2011, Jarvis and Pavlenko 2008:112–152, Latkowska 2010, Odlin 2008), much evidence of L1 conceptual transfer has been accumulated including that on L2 vocabulary acquisition. For example, conceptual transfer was identified in the acquisition of nouns for objects (Graham and Belnap 1986) and personhood pronouns (Barron 2006), adjectives, nouns and verbs for emotions (Pavlenko and Driagina 2007), spatial prepositions (Li and Cai in press), and motion expressions (Daller, Treffers-Daller, and Furman 2011), among others.

8) L2 learners may show individual variation in the types and extent of L1 transfer they exhibit in their use of L2. Odlin (1989) is the first who clearly pointed out the importance of individual variation in language transfer and provides some illustrations. Recently, Odlin (2012) further stressed the importance of individual variation by comparing L1 Finnish and L1 Swedish speakers' acquisition of L2 English and L3 English. What he ascertained are not only prominent inter-group differences in the omission of English articles between speakers with different L1 background, but also a wide range of individual variation among L1 Finnish speakers in their use of English articles and prepositions. However, besides Odlin, other researchers seem to ignore

individual variation in language transfer. Fortunately this situation is changing as Cai (2013) highlights individual Chinese EFL learners' use of motion event expressions in English within his newly designed research methodology based on a new definition of language transfer.

3 Theoretical and Empirical Findings on Bilingual Lexicon Representation, Activation and Production

3.1 Bilingual Lexicon Representation and Activation

In order to understand lexical transfer thoroughly, one needs to know how word-related knowledge is represented first. Aware of the debate on components of lexical representation, I endorse the triple-level representations including concepts, lemmas and lexemes (see De Bot 2004, Kroll and De Groot 1997, Jarvis 2009, Levelt 1989, Levelt et al. 1999). Drawing from these previous studies, Jarvis and Pavlenko (2008: 82) clearly illustrate these three representations in Figure 1. The first level of lexemes (the forms of a word) contains knowledge about the pronunciation and spelling of the inflectional forms of a word, together with morphological information. For example, the various forms *go*, *goes*, *going*, *gone* and *went* are instances of lexemes. Second, the lemma level involves a word's lexical entry available in a dictionary, such as GO in Figure 1. A lemma encompasses rich information, including grammatical class, subcategorization frame, and other syntagmatic (collocational and syntactic) constraints, and polysemic information. Finally, at the level of concepts, such information as visual, aural, olfactory, tactile, kinesthetic and other types of impressions, images, properties, schemas, and scripts are stored and organized into conceptual categories. These representations are relatively systematic, so speakers of the same language share some regularities in these representations. However, they are also subject to developmental changes and individual differences. That is, even speakers of the same language may differ in each of these representations and their representations usually change during their lifetimes.

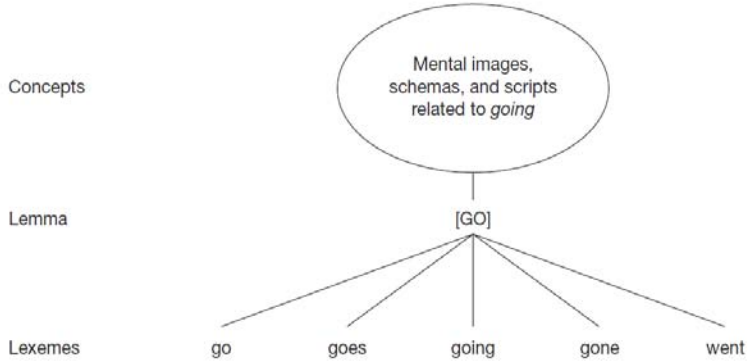

Figure 1: Three levels of lexical representation (from Jarvis and Pavlenko 2008: 83)

On the basis of monolingual lexical representation, it is necessary to understand how bilingual mental lexicon is stored and how representations are associated. Most studies have arrived at the consensus that for bilinguals L1 and L2 share the same conceptual representation, but have separate lemmatic and lexeme representations (e.g. Costa 2005, Francis 2005, Hermans 2000, Poulisse and Bongaerts 1994), as shown in Figure 2.

Nevertheless, the shared conceptual representation does not entail homogeneity. Instead, it encompasses three kinds of linguistic categories: L1-specific categories, L2-specific categories and shared categories (Pavlenko 2009: 147). The first two categories stand for conceptual nonequivalents and language-specific aspects of partial equivalents, whereas the last one reflects conceptual equivalence. This distinction is based on three types of relationships between linguistic categories in L1 and L2, namely conceptual equivalence, partial (non)equivalence, and conceptual non-equivalence (Pavlenko 2009: 133–142) In the case of conceptual equivalence or near equivalence, linguistic categories mediated by two languages share both category structure and boundaries. Unfortunately, many categories only overlap partially. Pavlenko (2009: 134–138) illustrates one particular subtype of partial (non)equivalence, i.e. nesting, which means two or more categories of one language are subsumed, fully or partially, within a larger category in another language (134). In the case of conceptual non-equivalence, a linguistic category of one language does not have a counterpart in another language (138).

A lexeme or lemma may have multiple connections (i.e. learned associations) with other lexical representations within and across languages,

and the likelihood of a lexeme or lemma activating a lexeme or lemma from another language appears to depend not just on whether there exists a crosslinguistic connection between them, but also how strong that connection is in relation to the other connections with which it competes (Jarvis 2009: 104). The strength of a connection is affected by such factors as frequency and recency of use, and the degree of similarity between the two lexical representations that mare mentally connected (Michael and Gollan 2005: 397-398).

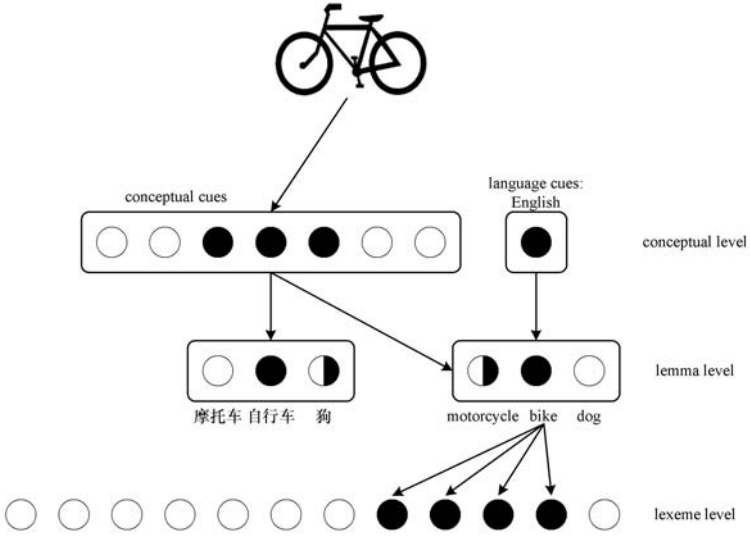

Figure 2: A model of bilingual language production
(Adapted from Pulisse and Bongaerts 1994 and Hermans 2000)

3.2 The Bilingual Production Process

The process of bilingual language production mainly consists of activation and selection.[1] Activation is composed of another two steps, from concepts to

1 The discussion of bilingual language process is mainly based on Costa (2005) with enrichment from other sources, but has been adapted within the three level representations. Costa distinguishes another three presentations, namely semantic representations, lexical nodes and phonological nodes.

lemmas and from lemmas to lexemes. The decision of which language to use is based on different types of information (pragmatic, contextual, etc.), like conceptual cues shown in Figure 2 (see La Heij 2005 for a detailed description of how to implement the language selection at the conceptual level). Therefore, the specification of language output is assumed to be finished at the conceptual system (De Bot 1992, Green 1998, Poulisse and Bongaerts 1994). Thus, lexical representations are activated from the conceptual level, and the decision of which language to adopt is also made at that level. According to non-selective activation models (e.g. Costa et al. 1999, De Bot 1992, Green 1998), a given activated conceptual representation would automatically spread a proportional amount of activation to any lemma representation to which it is linked. As a consequence, both the lemma nodes in the response language and their corresponding translation equivalents in the nonresponse language are activated. However, it is less clear whether the lexeme nodes corresponding to the non-selected lexical nodes are activated. (Costa 2005: 311–313)

Given that the conceptual level activates both lemma levels of a bilingual, it is essential to address how he ends up selecting target words from those activated. Before going into details, should be pointed out that the selection of the lexical node in the proper language is implemented at the lemma level, partly because lexical selection makes available the language-specific grammatical properties of the target lemma node (Costa 2005:312). The lexical selection mechanism involves not only the activated target lemmas, but also other lemma items from the two languages as competitors. If the discrepancy in activation levels between the target lemma node and other lemma nodes is large, selection is relatively fast. In contrast, if the level of activation of nontarget lexical nodes is similar to that of the target lexical node, lexical section is harder(Costa 2005: 313).

According to the language-nonspecific selection hypothesis, the lemma selection mechanism is sensitive to the activation levels of all lemma nodes regardless of the language to which they belong. It simply picks out the lemma node with the highest level of activation in any language (Herman 2000, Herman et al. 1998). Likewise, the activated lemma nodes activate corresponding lexeme nodes in both languages (e.g. Colomé 2001, Costa et al. 2000), the selection of the proper segmental information is determined by the activation levels of the segments forming the target word (Costa 2005: 316). And the activation of the lexeme nodes of the nonresponse language interferes with the target's lexeme encoding (see Colomé 2001, Costa et al. 2000).

In the framework of language-nonspecific models, it has been argued that lexical selection in the intended language is achieved by means of the active inhibition of the words in the nonresponse language. This inhibition is operated by the executive control system, whose role has been recognized in bilingual production and processing (Costa 2005, Green 1998, Linck et al. 2012), yet what it belongs to is controversial. According to Posner and Petersen (1990), it is part of attentional processes. There are three general types of brain networks for the attention system, and the corresponding attentional processes are composed of three separate categories including alerting (achieving and maintaining a state of alertness), orienting (selecting information in the sensory input), and executive control (monitoring and resolving conflict). It is the last category that is believed to govern both monitoring processes and inhibitory control. Some others (Baddeley 2003, Cowan 1999, Jarvis et al 2012, Trude and Tokowicz 2011) treat it (sometimes called 'central executive') as a component of working memory (WM). WM generally consists of a storage and a processing component. The storage component corresponds roughly with what has traditionally been regarded as short-term memory (STM), whereas the processing component is generally defined as executive control. Among other functions, executive control regulates the information stored in STM and keeps it in a viable state of activation.

A bilingual is faced with a cognitive challenge during speech production: lemmas and corresponding lexemes in both languages become active to some degree and may compete for selection (e.g. Kroll et al. 2008), suggesting that cognitive control mechanisms must be in place to handle this cross-language activation (Linck et al. 2012: 651). Some theorists have argued that inhibitory control may serve this role during bilingual speech production (e.g. Costa et al. 2006, Green 1998). Evidence in support of the inhibitory control account comes from a number of sources, including behavioral and neurocognitive studies of language switching (e.g. Jackson, Swainson, Cunnington and Jackson 2001, Meuter and Allport 1999).

According to Green's (1998) Inhibitory Control Model, there are multiple levels of control, but he specially elaborates on the inhibition functioning at the lemma level. All lemma nodes contain tags specifying to which language they belong. When lemmas in the nonresponse language are activated during lexical access, they are inhibited by virtue of their nonresponse language tag, thereby allowing the lemmas in the response language to be selected. This model has three noteworthy features (Costa 2005: 320). First, the inhibition applied to the lemma nodes of the nonresponse language is reactive in the

sense that it is only functional after the lemma nodes have been activated. It also assumes that more active lemma nodes will be more suppressed. Second, despite this inhibition mechanism, the lemma nodes of the nonresponse language interfere during lexical section in the response language. Third, the activation of the lexeme nodes is restricted to those that correspond to the selected lemma nodes. Among these features, the last one is at odds with those experimental results that show that the activation of lemma nodes in the nonresponse language also spreads to their lexeme level (Colomé 2001, Costa et al. 2000).

4 A Psycholinguistic Model of L2 Lexical Production

On the basis of previous research findings on bilingual representation, activation and production, I postulate a psycholinguistic model of L2 production (see Figure 3), then try to account for how various types of lexical transfer occur during the L2 production process.

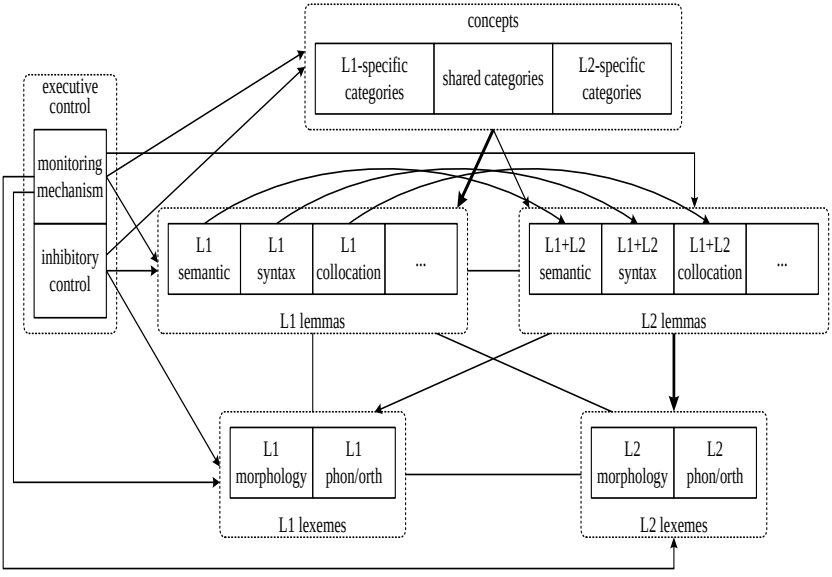

Figure 3: A psycholinguistic model of bilingual lexical production

This model demonstrates that a bilingual possesses three levels of lexical representations that are affected by the monitoring and inhibitory control mechanism of executive control. A bilingual has three levels of representations (see section 3.1 for details) that are connected at the same level and across levels. At the top of this model, the conceptual level consists of L1-specific categories, shared categories and L2 specific categories (Pavlenko 2009, see section 3.1 for details). In the middle of this model is the lemma level including separately distributed but closely connected L1 lemma and L2 lemma. According to Jarvis (2009), the lemma comprises semantic, syntactic and collocational information, among others. Thus, these three types of specifications are available in L1 lemma. However, the case of L2 lemma is more complicated.

Jiang (2000) suggests L2 lemma representation changes at three stages in instructional settings. At the initial stage, a lexical entry in L2 does not contain content, but only formal specifications, particularly phonological and orthographical information. It may also contain a pointer that directs attention to the L1 translation equivalent. Then at the second stage, the information in L1 lemmas is copied or attached to L2 lexical forms to form lexical entries that have L2 lexical forms but semantic and syntactic information of their L1 translation equivalents. This is made possible through repeated simultaneous activation of L2 lexical forms and L1 lemma information in L2 use. Finally at the third stage, the semantic, syntactic and morphological specifications of an L2 word are extracted from exposure and use and integrated into the lexical entry. Among these hypotheses, the L1 lemma mediation at the second stage has been proved in terms of semantic content (Jiang 2002, 2004). Along this line, it stands to reason to believe that syntactic and collocational information can be transferred to an L2 entry as well.

Since the initial stage is only a starting point and the third stage cannot be reached for nearly all learners, the lexical representation and development at the second stage has special importance. Regarding the content of L2 content, I hold some points a little different from Jiang's (2000: 53)

Figure 3a. It is not very likely that L2 content only includes what has been copied from L1 lemmas and L2 form does not include morphological specification in the instructional settings. According to my personal experience and knowledge about EFL learning and teaching in China, students have begun to learn some morphological, semantic, syntactic and collocational knowledge about English words from teachers very early and for many years.

Therefore, it is more reasonable to accept that L2 lemmas comprise a mixture of L1 and L2 content.

At the lowest level, both the L1 lexeme and the L2 lexeme contain their own morphological and phonological/orthographical information. Of course, it should be kept in mind that the L2 formal information is impoverished in many ways.

Executive control is indispensable from bilingual production (Costa 2005, Green 1998, Linck et al. 2012). As its two components, inhibitory control and monitoring mechanism are probably both involved in the L2 production process and L1 transfer (see Figure 3), though the former is often stressed (Jarvis 2013, Trude and Tokowicz 2011) and the latter is often neglected (but see Levelt et al. 1999). Inhibitory control is the ability to inhibit (or suppress) distracting, interfering or misleading information while performing a task (Jarvis 2013: 289). The monitoring mechanism is responsible for discovering the differences between two or more elements of the languages activated in bilingual production.

These two components are subject to development and vary even in people at the same age and with the same language experience. Studies of WM have discovered that bilinguals have great individual differences in WM capacity, including monitoring capability and inhibitory control (e.g. Conway and Engle 1994, Michael, Tokowica and Kroll 2003). Learners who already have more developed executive control differ from learners with weaker executive control in relation to the types and amounts of crosslinguistic influence they exhibit in their use of an L2 (Trude and Tokowicz 2011). Thus, individuals with better monitoring abilities may be better detecting the differences between translation pairs. And individuals with higher inhibitory control capability may be better at suppressing irrelevant information than individuals with lower inhibitory capability. Furthermore, the executive control mechanism does not operate equally in different tasks and towards various words. For instance, the monitoring mechanism may work less efficiently in speeches than in writings, and inhibitory control works better with translation pairs with more obvious discrepancies and with high frequency words.

5 An Account of Various Types of L1 Lexical Transfer

By applying the psycholinguistic model of L2 lexical production, I here provide explanations for the accumulated findings on lexical transfer (see section 2) following the order of L2 production. Specifically, I begin with conceptual transfer, then lemmatic transfer and finally lexemic transfer. It should be recalled that lemmas comprise rich content including semantic, syntactic and collocational specifications, and lexemes contain formal information including morphological and phonological / orthographical features. Therefore, a discussion of those various types of transfer is respectively related to these two representations.

When a bilingual intends to express his meaning in a written or oral form, he should initially activate some relevant concepts at the conceptual representation (see the upper level in Figure 3) and executive control almost immediately starts to work. In the case of an L1-specific category, if the bilingual is able to monitor its uniqueness and inhibit its interference, he successfully suppresses the occurrence of negative conceptual transfer; however, if he does not detect it is L1-specific, wrongly regards it as a shared category and then selects it, negative conceptual transfer may occur. When a shared category is activated, the monitoring mechanism usually automatically lets it pass the screening, and positive conceptual transfer occurs. But occasionally the monitoring mechanism fails to label it as shared and blocks the potential positive conceptual transfer. An L2-specific category may be activated after it is represented in the mind through exposure to relevant L2 input. Its activated and selection usually does not involve L1 conceptual transfer.

After target concepts are selected and the target language is determined with the aid of conceptual cues (refer to subsection 3.2), the activation is passed to the lemma representations. At this level, the L1 lemmas, their translation equivalents and other relevant lemmas are simultaneously activated. Among them, the L1 lemmas receive the strongest activation first, which is passed to their L2 translation equivalents. The target L2 lemmas are soon selected due to their response language tags and organized according to their syntactic specifications, which are mapped onto from their L1 counterparts, while the L1 lemmas are suppressed for their nonresponse language tags. To put it simply, positive lemmatic transfer tends to occur here because L1-L2 translation equivalents, similar in semantic, syntactic and

collocational properties, are strongly associated and the activation passed from L1 to L2 help activate the L2 equivalents. In this process, the executive control mechanism monitors the degree of similarity between the L1-L2 lemmas, finds them congruent, permits the activation from L1 to L2, but suppresses the selection of L1 lemmas according to their nonresponse language tags. As to the documented cases where positive lemmatic transfer does not occur when objective L1-TL (first language – target language) similarities do exist, it is simply because the learners' monitoring system is not sensitive enough to identify the congruence between L1-TL words so that their L2 lemmas are not appropriately associated with corresponding L1 lemmas. Thus, even when L1 lemmas are activated, their corresponding L2 lemmas are not necessarily activated and L1 transfer may possibly fail to occur. Likewise, whether negative lemmatic transfer occurs is determined by the relationship between L1 and L2 lemmas and the functioning of executive control. If the L1 lemma differs from its TL counterpart to some extent in terms of semantic, syntactic and collocational information, but the monitoring mechanism fails to capture their subtle differences and mistakenly treats them as equal, each type of negative transfer may display. Of course, this potential negative lemmatic transfer may not be manifested; if a bilingual's inhibitory control system is sensitive and efficient, he may suppress this potential negative transfer.

During the process of lexical choice at the lemma level, a bilingual often encounters one-to-one ease and one-to-many difficulty as mentioned in section 2. These two phenomena can be explained from the perspective of lemma activation and selection. When the activation from the conceptual level is passed to the lemma level, both an L1 lemma and its closely related translation equivalents are activated. If the L1 lemma is connected to one L2 counterpart, the content of the former is mapped onto the latter, facilitating a bilingual's acquisition of the content of the L2 lemma (see Figure 3). Nevertheless, if one L1 lemma is related to several L2 equivalents, when they are activated simultaneously, the L1 lemma content is mapped onto all the L2 equivalents. The one L2 lemma that a speaker is most familiar with receives the highest activation level and is selected because of its strongest connection with the L1 lemma, which is further ascribed to high frequency from TL input. This tendency may result in positive or negative L1 lemmatic transfer depending on whether the L2 lemma is appropriate or not. If it is not a suitable choice, its activation is hopefully inhibited. Otherwise, negative transfer will occur.

After L2 lexical entries are chosen at the lemma representation, the activation is passed to the lexeme level. L2 lexemes are more strongly activated than L1 lexemes as the former are more closely related to L2 lemmas. The monitoring mechanism automatically compares the formal features of the two languages possessed by a speaker. If it detects no or little similarities between two nonrelated languages, the inhibitory control will suppress the activation of L1 lexemes. That is why formal transfer seldom appears in nonrelated languages. If it captures some formal similarities between two related languages, some morphological, phonological and orthographical features can be borrowed to L2 lexemes and thus lead to specific formal transfer.

At this moment, it is easy to see the essential difference between semantic transfer and formal transfer. Semantic transfer occurs at the lemma level, reflecting the mapping from L1 semantics to L2 semantics regardless of their being related or distant, because the establishment of L1-L2 semantic connections is carried out relatively subjectively though is partly based on their objective similarities. Formal transfer appears at the lexeme level, on the prerequisite that there are formal connections between corresponding L1-L2 formal features, which are usually observable in language input. This explains why Polish learners often made errors caused by semantic transfer, whereas German learners' errors often resulted from formal transfer (Biskup 1992).

Along the same line, the individual variation in L1 lexical transfer can be explained from the interaction by bilingual lexical representation and executive control. On the one hand, bilingual memory representation, not uniform across all bilingual populations, is affected by many factors, including L2 proficiency, word type, word frequency and L2 learning environment, among others (De Groot 2002: 41–45). Even learners in the same class learning in the same context, for example classroom settings in China, may differ in their Chinese-English bilingual representations in terms of some specific words, though their general L1 proficiency is almost the same and general L2 proficiency is similar. On the other hand, those learners may vary in their executive control abilities, including monitoring and inhibition. Therefore, when in face of the same bilingual lexical relations, some of them may be better at monitoring their similarities and differences. After the differences are detected, some may suppress the L1 interference but others may not.

6 Conclusion

In this paper, I proposed a psycholinguistic model of L2 lexical production based on existing theoretical and empirical studies on bilingual representation, activation and production. I then applied this model to account for the accumulated findings on L1 lexical transfer, concerning influences of similarities and differences, conceptual transfer, several types of lemmatic transfer (semantic, syntactic and collocational transfer), some kinds of lexemic transfer (morphological, phonological and orthographical transfer), and variation in lexical transfer. These manifestations of lexical transfer in L2 production generally result from the interactions of bilingual representation and executive control, though they involve specific working processes.

The psycholinguistic model outlined and theoretical accounts of various types of lexical transfer are essentially hypothetical, although many points in them are based on empirical research. Thus they call for more empirical studies on bilingual lexical production from the perspective of psycholinguistics and crosslinguistic influence.

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