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The mapping process from L2 lexical forms to L1 meaning

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Abstract

This study investigates two models of L2 vocabulary acquisition at an advanced L2 level: L1 lemma mediation and the revised hierarchical models. Proponents of the L1 lemma mediation model postulate that advanced L2 learners map L2 words to L1 meanings or concepts, whereas proponents of the revised hierarchical model argue that the increasing experience in L2 helps learners remap the L2 words to their L2 meanings. In this study, 26 proficient Arab L2 speakers of English and 26 English native speakers were given 76 semantically related word pairs and were instructed to rate their semantic relatedness on a 5-point Likert scale as quickly as possible. It was found that word pairs sharing the same Arabic translations had been rated significantly higher than word pairs not sharing the same Arabic translations. The results supported the L1 lemma model—namely, even advanced L2 learners still rely on their L1 to access the meanings of L2 words.

Keywords: lemma; lexical entry; semantic relatedness; mapping process; conceptual system

1. Introduction

A lexical item is not devoid of information; if it were, the language used could not properly use it phonetically, morphologically, semantically, or syntactically. Rather, every lexical item is equipped with a lexical entry that contains all the information a language user needs to use correctly. Levelt (1989, 1993) proposed one of the most well-known structures of a lexical entry. As shown in Figure 1, the lexical entry is stratified into lemma and lexeme. The lemma stratum contains the semantic and syntactic information whereas the lexeme stratum contains the morphological and phonological information about the lexical item.

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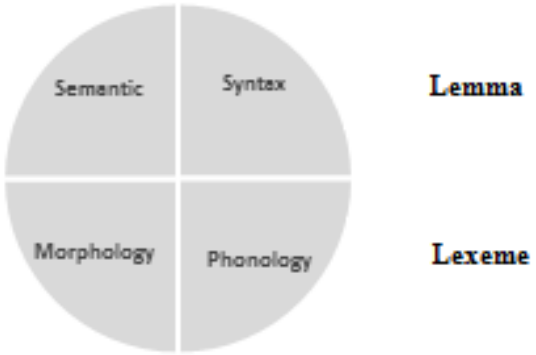

Figure 1. The lexical entry in the mental lexicon (Levelt, 1989)

In the literature concerning the monolingual lexicon, the acquisition of L1 vocabulary undergoes three stages (Harris, 1992; Ying, 2017). The first stage starts from birth when infants hear words all around them until they can produce their first words. The stage lasts until the child's lexicon includes at least 30 words. The second stage is the expansion stage of vocabulary, which lasts for several years; during this stage, the child's lexicon acquires a large number of words. The final stage is when the child starts to have a deep semantic understanding of words, such as the way the words are reorganized. In this stage, the lexical items stored in the child's lexicon have all the lemma and lexeme information for accurate use. In terms of the semantics of the lexical items, the question of how the L1 speaker associates the lexical item with its meaning receives less controversy the psycholinguistic literature (e.g., Brysbaert & Duyck, 2010; Guo et al., 2012; Thierry & Wu, 2007; Ying, 2017), which has well established that the L1 lexical form is mapped to the already existing meaning or concept in the L1 speaker's conceptual system as schematized in (1):

(1) L1 lexical form → L1 meaning/concept

However, there is a controversy regarding the question of how the L2 speaker associates the L2 lexical item with its meaning or concept. Some scholars have argued that the acquisition of L2 vocabulary is similar to the acquisition of L1 vocabulary in terms of the process by which the L2 lexical form is associated with the new L2 meaning or concept (e.g., Bogaards, 2001; Ellis, 1995), as schematized in (2):

(2) L2 lexical form → L2 meaning/concept

Meanwhile, other researchers have argued that the process of L2 vocabulary acquisition is not the same as the process of L1 vocabulary acquisition. Instead, the L2 lexical form is mapped to the L1 meaning or concept that already exists in the L2 speaker's conceptual system (e.g., Jiang, 2004; Jiang, 2002), as schematized in (3):

(3) L2 lexical form → L1 meaning/concept

The mapping represented in the schema in (2) cannot be upheld for compelling evidence against it (see, e.g., Guasch et al., 2008; Jiang, 2004; Jiang, 2002; Kroll et al., 2010). A weaker version of the claim, known as the revised hierarchical model (RHM), was introduced; the mapping in (3) is true for low proficient L2 speakers, and the mapping of an L2 lexical item to L2 meaning/concept happens in the final stage of the developmental process of L2 vocabulary acquisition. In other words, a proficient L2 speaker successfully maps the L2 lexical form to an L2 meaning or concept just like L1 speakers who map the L1 lexical form to an L1 meaning or concept.

The question that arises, and which is the main focus of this article, is to which concept/meaning is an L2 lexical form mapped? to a new concept/meaning represented in schema (2) as an effect of language development suggested by RHM or to a meaning/concept that already exists in the

conceptual system of the adult L2 learner represented in schema (3)? The answer to this question is crucial as it gives us a deep understanding of the kind of semantic information being incorporated into the lexical entry of L2 words.

1.1. Theoretical background

1.1.1. Revised Hierarchical Model (RHM)

RHM is a developmental account for mapping the L2 lexical form to meaning/concept. According to Kroll and de Groot (1997), acquiring L2 vocabulary is a developmental process. Less proficient L2 learners associate L2 words with L1 meaning/concept via L1 translation. In this way, the L2 lexical form is said to be mapped to a meaning or concept that already exists in the learner's conceptual system. The repeated association between an L2 lexical form and its L1 meaning or concept through L1 translation along with the increasing proficiency of L2 learners will lead to the deactivation of L1 translation, and the learners will start to process the L2 word just like L1 speakers by establishing a direct link between the L2 word and its L2 meaning or concept. This ultimate stage indicates a restructuring of the L2 lexical entry, where the L2 semantic information is finally incorporated into it. Proficient L2 speakers are then said to be successful in accessing the L2 meaning/concept directly without L1 translation. Examples (4) and (5) illustrate Kroll and de Groot's developmental model:

(4) Beginning Arab L2 Learner of English:

a. I went to the *library* to buy some pens.

b. I went to the *library* to buy a classic novel.

c. I spent two hours in the *library* reading a history book.

(5) Proficient Arab L2 Learner of English:

a. I went to the *stationary* to buy some pens

b. I went to the *bookshop* to buy a classic novel.

c. I spent two hours in the *library* reading a history book.

Library, stationary, and bookshop share the same Arabic translation "maktabah" (in some Arabic dialects). According to the developmental model, we expect that beginning Arab L2 learners would use the lexical form library to refer to stationary, library, and bookshop because they are at a stage when they still map the L2 lexical form "library" to the three meanings that already exist in their L1 conceptual system by utilizing the L1 translation (i.e., "maktabah").

(6) English L2 word (*library, stationery, bookshop*) → Arabic L1 meaning (maktabah)

However, according to the developmental model, the remapping of an L2 word to an L2 meaning and concept is determined by increasing expertise in L2. With increased proficiency and experience in L2, the Arab learner begins to remap the L2 words to new meanings/concepts without L1 translation, producing examples as in (5) and those represented in (7).

(7) a. English L2 word (stationary) → English L2 meaning (stationary)

b. English L2 word (bookshop) → English L2 meaning (bookshop)

c. English L2 word (library) → English L2 meaning (library)

Guasch et al. (2008) conducted a translation recognition task with 123 Spanish L2 learners of Catalan who were divided according to their level of L2 proficiency: beginners, intermediates, and advanced. The aim of their study was to investigate if the level of proficiency plays a role in the strength of the connection between the lexical and semantic representations. Guasch et al. (2008) explained developmental theory as that learners at the beginning stages of L2 learning develop weak

connections between L2 words and their meanings or concepts so that they need their L1 as means of mediation between them. As their proficiency of L2 increases, those connections are strengthening and the L2 learners start to dispense with L1 mediation which means a direct connection is being re-established between L2 lexical form and its L2 meaning/concept.

Accordingly, the more proficient an L2 learner is, the faster translation-recognition responses with lower error rates s/he will produce. The predicted pattern is illustrated in Figure 2.

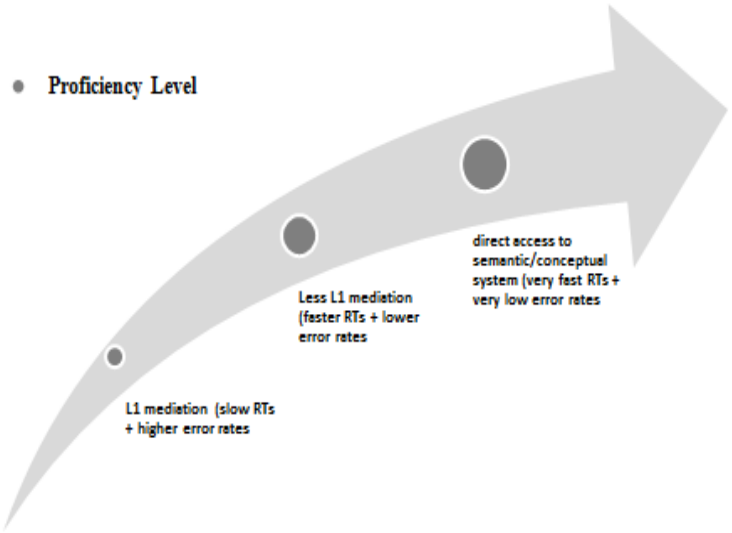

Figure 2. The developmental pattern for form-to-meaning

Guasch et al. (2008) created lists of L2 (Catalan)–L1 (Spanish) word pairs in which the semantic relations were manipulated. In one list, the L1 word is a false translation of the L2 word, yet is related in either form or meaning.[2] Another list contains word pairs where the Spanish word is a perfect translation of the Catalancounterpart. In the experiment, the participants judged whether L1 is a perfect translation of L2. Each member of a word pair is presented, with an L2 word first for 750 ms followed by its L1 correspondent for another 750 ms. The presentation of both members was separated by a fixation point for 750 ms as well. Error rates and reaction times were recorded. The time counting started once the L1 word was shown on the screen and continued until a decision is made.

However, the results did not show a developmental pattern. All groups were affected by form-manipulated pairs; they had higher error rates and slower recognition times. The data did not align with the predictions presented in Figure 2, which would demonstrate the opposing view—namely, that even proficient speakers of L2 access the meaning of L2 via L1.

The developmental pattern in Figure 2 not only manifested itself in Ma et al.'s (2017) experiment, but also revealed a contradictory finding that a less proficient Chinese L2 learner of English can map an L2 lexical form to its L2 meaning/concept directly, thereby supporting the word-meaning mapping schematized in (2) and raising questions about the selection of participants, the materials used, and the procedures followed.

In a developmental pattern, as L2 learners' proficiency increases, they move towards a native speaker's performance in terms of having immediate access to the semantics of L2 lexical form without L1 translation/mediation; that performance should be manifested in the results of behavioral experiments as illustrated in Figure 2. What further weakens the developmental theory on the nature of word-meaning mapping is that other studies have shown that, under some circumstances, advanced

[2] For form/meaning manipulation examples, see Guasch et al. (2008: 297).

speakers of L2 rely on L1 translation equivalents of L2 (see, e.g., Kroll *et al.*, 2010), supporting schema (3), regardless of the proficiency of the L2 speakers. This model is known as the L1 lemma mediation model, developed by Jiang (2002, 2004), and will be discussed in the following section.

1.2. L1 Lemma Mediation Model (L1 LMM)

Jiang (2002, 2004) strongly argued against the re-incorporation of new semantic information into the lexical entry of the L2 word as part of the developmental process. He refuted the developmental aspect in the process of acquisition that leads to remapping the lexical form to a new meaning or concept. Jiang's theory centers around the method of mapping from L2 words to the meaning/concept that already exists in the L2 learner's conceptual system via L1 translation or direct access.

Initially, less proficient L2 speakers get access to the semantic information of an L2 lexical form through translating it into L1 meaning/concept.

(8) *Beginning L2 Learner of English:*

L2 Lexical form —L1 translation→ L1 meaning/concept

With their increased expertise in L2, the L2 word is no longer mediated via L1 translation but rather directly to the L1 meaning.

(9) *Proficient L2 Learner of English:*

L2 Lexical form —Direct access→ L1 meaning/concept

L1 meaning/concept

This shift from mediation in (9) results from the repeated coactivation of the L2 words and the L1 lemma information provided by its L1 translation. Jiang (2002) argued that the L1 lemma information is imprinted in the lexical entry of the L2 word, making it very hard to be replaced with the new meaning or concept of the L2 word. One observation in support of Jiang's model is that some advanced L2 learners fail to distinguish between two L2 lexical items because no lexical distinction is made in their L1. For example (taken from Jiang, 2002: 620):

(10) I go to the *oven* in the morning to buy bread. (cf. *bakery*)

This sentence was uttered by an Arabic native speaker in which he/she made word-choice errors: *bakery* and *oven* have the same translation "furn" in some Arabic dialects. However, this evidence may not be informative because there are also advanced L2 bilinguals who do not make such word-choice errors, which might also be taken for the theory of form-meaning remapping. Therefore, Jiang (2002) suggested that more reliable evidence is needed to support his L1 lemma, mediation model. He conducted a judgment task on 25 Chinese participants who were proficient speakers of English. Two lists of English word pairs were randomly mixed; one list included words related in meaning while the other list included words that were unrelated in meaning. The pairs of the first list were manipulated; some of these pairs shared identical L1 translations. Participants were required to judge the degree of relatedness of each pair on a 5-point Likert scale ranging from not semantically related to semantically related. According to Jiang's theory, the pairs that share the same Chinese meaning should be rated 4 or 5 more significantly than any other pairs—a prediction borne out by the results of this task. Thus, although the Chinese participants were very proficient, they still relied on their L1 to make their lexical decisions.

1.3. Research questions and predictions

Many previous studies on word-meaning mapping have revealed that, in the process of vocabulary acquisition development, less proficient L2 users need their native language to comprehend and use L2 words. The controversy, however, centers more on highly proficient L2 learners: do they map L2 words directly to the L2 meaning/concept as argued by Guasch et al. (2008) and Ma et al. (2017), among others, or to the L1 meaning/concept as argued by Jiang (2002, 2004)? The present research will seek to answer this question by conducting a lexical judgment task adapted from Jiang (2002) on very highly proficient Arab L2 speakers of English and native speakers of English. According to Jiang (2002), a pair of synonyms in one language may have only one translation or different translations in another language. Consider, for example, the word pairs *gift–present* and *true–real*. Both are semantically related in English. The two pairs are also semantically related in Arabic, but the difference is that the first pair shares the same Arabic translation whereas this is not the case for the second pair. The assumption of this research is that, if a group of proficient Arab L2 speakers is presented with two lists of such pairs and asked to rate their semantic relatedness, two predictions considering RHM and L1 LMM are assumed as follows:

i. If the proficient non-native's rate both types of pairs as semantically related without significant difference between them, RHM will be borne out because they do not resort to their native language to access the semantics of L2 words. The L2 lexical entries of these words contain new semantic information acquired during the process of L2 lexical development, which is why they do not distinguish between the two pairs based on the L1 translation.

ii. If the proficient non-natives rate the same-translation word pair as semantically related more significantly than they do the different-translation pairs, L1 LMM will then be supported because the participants distinguished between the two types of pairs based on the L1 translation, which means theoretically the lexical entries of L2 words are still associated with the L1 meaning/concept regardless of their high proficiency in English.

The significance of this research is that it will provide a more thorough understanding of how proficient speakers of an L2 process the meaning of L2 words.

2. Method

2.1. Participants

Twenty-six proficient Arab L2 speakers of English (NNs) volunteered to participate in this experiment. Twenty-six monolingual English native speakers (Ns) agreed to participate, and they were compensated. The Ns were undergraduate students at different universities in the UK and were contacted through a linguistics research group on Facebook. The NNs were proficient speakers of English and had earned postgraduate degrees in either English literature or English linguistics, for which they had to earn high IELTS or TOEFL scores for admission to the programs. Twenty had a master's degree; 14 had obtained their degree from different English-speaking countries while six had earned it in Saudi Arabia. In addition, six had doctorate degrees: two from the UK and four from different Arab-speaking countries. Master's degree holders had received an average of 6 years of previous formal instruction and training in English, compared to Ph.D. holders' average of 13 years.

2.2. Materials

Eighty semantically related pairs of words were first included; 60 were from Jiang (2002: 637), in whose study their semantic relatedness had been judged by three native speakers, and 20 were

constructed by the author and their semantic relatedness was judged by three native speakers. The members of the word pairs were then separated. The first members were given to three Arab speakers of different dialects (i.e., Saudi, Jordanian, and Egyptian) to translate into Arabic. They had to give the translation that first came to mind. A week later, they did the same for the second member of the word pairs. The members of the pairs were then re-joined along with the three translations provided by the judges. If the three judges gave an identical translation to a word pair, the pair was classified as same-translation. If their translations differed, then the word pair was classified as different-translation. The process produced 38 same-translation pairs and 38 different-translation pairs; 4 pairs were excluded because of missing translations. Thus, 76 pairs of words were included in the experiment (see Appendix). They were randomly mixed with 22-word pairs that served as distractors using the Latin Square technique. The 98 pairs of words were prepared in a table in paper form along with a 5-point Likert scale for rating.

2.3. Data collection and analysis

The participants signed consent forms detailing the general purpose of the experiment. They were given instructions about how to complete the task. The participants had to rate each word pair in terms of the semantic relatedness of its members—that is, how strongly they were related, with 1 indicating a very weak semantic relationship and 5 indicating a very strong semantic relationship. They were asked to rate the word pairs very quickly to minimize the possibility that they would translate the words while rating the pairs. Before starting the real task, they practiced rating six-word pairs as quickly as possible. The purpose of this step was to ensure that they understood how to complete the task. The collected data were analyzed using SPSS to extract descriptive and inferential statistics.

3. Results

The mean rating scores for each same-translation word pair for Ns and NNs were calculated. The highest mean score rated by Ns was 4.69 for the pair delicious–tasty while the lowest mean score was 3.15 for the pair's local–domestic and exercise–practice. For NNs, the highest mean score was 4.88 for the pair present–gift whereas the lowest mean score was 3.23 for the pair desk–table.

The same procedure was performed for each different-translation pair. The results revealed that the highest mean score rated by Ns was 4.38 for the pair loud–noisy while the lowest score was 2.69 for the pair estimate–evaluate. NNs' highest mean rating score was 4.03 for the pairs criteria–standard, hope–wish, and safe–secure while the lowest mean score was 1.96 for the pair accept–receive. The results are summarized in Tables 1 and 2.

Table 1. Highest mean scores for same-translation and different-translation pairs rated by Ns and NNs

Participant Type	Word-pair Type	Highest mean score	The word pair
Ns	Same-translation pair	4.69	*delicious–tasty*
	Different-translation pair	4.38	*loud–noisy*
NNs	Same-translation pair	4.88	*present–gift*
	Different-translation pair	4.03	*criteria–standard* *hope–wish* *safe–secure*

Table 2. Lowest mean scores for same-translation and different-translation pairs rated by Ns and NNs

Participant Type	Word-pair Type	Highest mean score	The word pair
Ns	Same-translation pair	3.15	*local–domestic*
			exercise–practice
	Different-translation pair	2.69	*estimate–evaluate*
NNs	Same-translation pair	3.23	*desk–table*
	Different-translation pair	1.96	*accept–receive*

The mean rating scores for each word type were also calculated for each participant type. The mean score for same-translation pairs given by Ns and NNs was the same: 4.11. The mean scores for different translation pairs given by Ns and NNs were 3.49 and 3.06, respectively. The results are represented in Table 3.

Table 3. Mean scores for same-translation and different-translation pair type-rated by Ns and NNs

Word-pair Type	Ns	NNs
Same-translation pair	4.11	4.11
Different-translation pair	3.49	3.06

A two-way ANOVA test was carried out to find out any significant difference in the rating scores between (i) same-translation and different-translation pairs and (ii) Ns and NNS as well as (iii) if the interaction between participant type and word-pair type produced a main effect. The results showed the following:

i. A significant difference emerged in the rating scores between same-translation and different-translation pairs, with the different-translation pairs having a low mean score of 3.28 due to the low mean scores given by NNs (3.06): $F(1,50) = 606.53, P > .05$.

ii. A significant difference emerged in the rating performance between Ns and NNs, with the former providing a higher score of (3.73): $F(1,50) = 41.93, P > .05$.

iii. A statistically significant interaction occurred between the effects of participant type and word-pair type: $F(1,50)= 41.93, P > .05$.

Figure 3 illustrates the difference in the rating task between Arab and English speakers for same-translation and different-translation pairs. The different-translation pairs were given significantly low scores due to NNs' ratings.

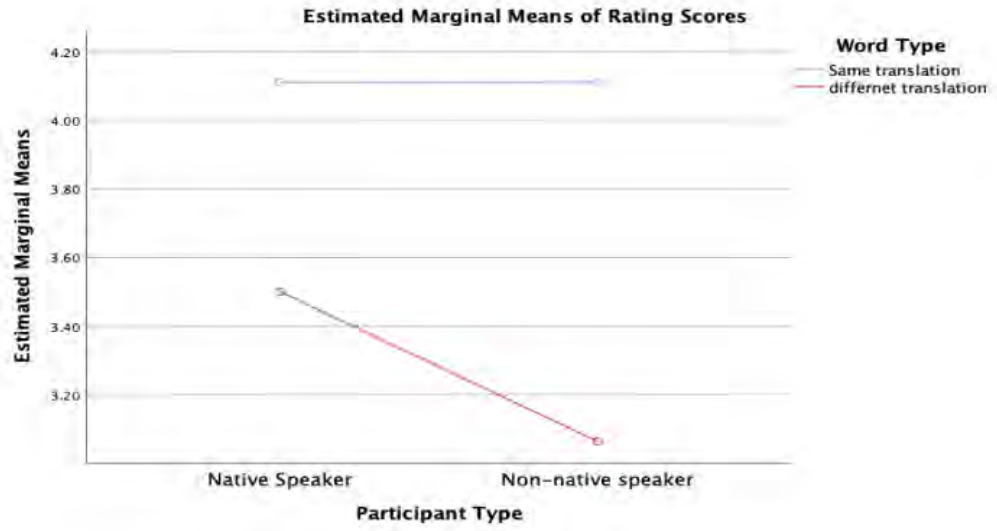

Figure 3. The rating means scores for same- and different-translation pairs by Ns and NNs

4. Discussion

The results showed that the advanced L2 participants rated the two types of pairs differently. Same-translation pairs received higher scores because of the great semantic overlap between the members of the pairs. To illustrate, there is no lexical distinction between gift and present in Arabic since both share the same translation. Such pairs were rated high by NNs, thereby fulfilling the prediction of Jiang's L1 lemma model, indicating that advanced L2 speakers will give the words that share the same L1 translation high scores because the L1 lemma information is copied in the lexical entry of the L2 word. In the case of gift and present, the L1 meaning "hadyyah" is incorporated into the lemma information of both English words.

On the other hand, the different-translation pairs received lower scores because the lexical entry of each member has different L1 information, thereby weakening their semantic relatedness for NNs. If the direct access to the L2 meaning had been the case, as predicted by RHM, the participants would not have rated the different-translation pairs as significantly low.

The non-native speakers' reliance on their L1 to access the meaning of L2 words shown in the present research would contribute to the debate on monolingual versus bilingual approaches to teaching in the classroom context where teachers and students share the same L1. The importance of monolingual teaching has been asserted since the 19th century; its main goal is to enable L2 learners to emulate native speakers (Hall & Cook, 2012). However, as confirmed in this research and argued in Cook (2008), advanced L2 speakers and native speakers have different language processing. The former develops what Cook called "multicompetence", which refers to the assumption that bilinguals are different from monolinguals in that they have different uses for language, different knowledge of both L1 and L2, and different language processing. Following from this, the L1 translation should not be prohibited in an L2 classroom, an argument supported further by Rathert & Cabaroğlu's (2020) and Yuvayapan's (2019) studies. As argued in Jiang (2002), L1 translation is a strategy used by L2 learners at a beginning level in order to access the meanings/concepts of L2 lexical forms, and with the repeated association between L2 words and L1 meanings/concepts mediated by L1 they will eventually be able to have direct access to the semantic information of L2 words already existing in their conceptual system. In other words, the L1 translation will facilitate L2 learning and help learners achieve multicompetence. The debate of monolingual versus bilingual approaches to teaching and learning is beyond the scope of this research, yet the importance of this debate motivated the author to

take another step towards investigating the same research question by conducting an online judgment task in which the reaction times of participants' responses were recorded to minimize the opportunity to use their conscious knowledge, Such an effect may be used as a criticism of the findings of the present research, although the participants were guided and trained to make their judgments as quickly as possible. As Jiang pointed out, "the speed requirement minimized the possibility that participants would translate while performing the task" (2002: 626). The findings will contribute to the debate of monolingual versus bilingual approaches to teaching on solid ground.

5. Conclusion

In conclusion, this research investigated two models of L2 vocabulary acquisition at the advanced level. First, the L1 lemma mediation model asserted that advanced L2 learners do not map L2 lexical items to L2 meaning because L1 lemma information is copied onto the lexical entries of those L2 lexical words. Second, the revised hierarchical model stated that advanced L2 learners are able to "remap", which means that their expertise in language will help them replace the L1 lemma information already existing in the lexical entries of the L2 lexical form with the L2 meaning or concept. The results supported the L1 LMM in that even advanced L2 speakers relied on their L1 to access the meaning of L2 words.

6. Ethics Committee Approval

The author confirms that this study does not need ethics committee approval.

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Appendix[3]

Same-translation pairs	*Different-translation pairs*
accurate-precise	*ability-competence*
anxious-worried	*accept-receive*
arrange-organize	*achievement-success*
chair-seat	*action-behaviour*
chance-opportunity	*advantage-benefit*
clever-smart	*advice-suggestion*
danger-risk	*apology-regret*
desk-table	*appear-occur*
doubt-suspect	*artist-painter*
error-mistake	*authority-expert*
exercise-practice	*believe-trust*
foolish-stupid	*black-dark*
glad-pleased	*borrow-lend*
goal-aim	*clinic-hospital*
journey-trip	*compare-contrast*
likely-possible	*concept-thought*

[3] Pairs with * are created by the author.

refuse-reject	*conclusion-decision*
component-element	*condition-situation*
inform-tell	*control-manipulate*
**admit-confess*	*creation-invention*
**afraid-scared*	*criteria-standard*
**amazing-awesome*	*date-day*
**begin-start*	*debate-discussion*
**big-large*	*decrease-lower (v.)*
**brave-courageous*	*design-plan*
**choose-select*	*dialogue-talk*
**delicious-tasty*	*discover-find*
**fix-repair*	*door-gate*
**end-finish*	*draw-paint*
**intelligent-smart*	*enjoy-like*
**help-assist*	*equipment-machine*
**idea-thought*	*estimate-evaluate*
**listen-hear*	*example-model*
**local-domestic*	*family-home*
**present-gift*	*fetch-take*
**Pretty-beautiful*	*force-power*
**quick-fast*	*future-tomorrow*
**sick-ill*	*game-sport*
**difficult-hard*	*good-nice*

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