

Task-Dependent L2-L1 Translation Priming: An Investigation of the Separate Memory Systems Account

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The masked translation priming asymmetry has proven to be an important point of departure in the development of a theory of bilingual lexical representation and processing. The nature of this asymmetry is as follows. Decision times are positively affected in the lexical decision task (is it a word or not?) when second language (L2) targets are preceded by their L1 translation equivalent. This is true even when the L1 primes are masked such that the participants are unaware of their presence, and, hence, the bilingual nature of the task. This masked translation priming effect in the L1-L2 direction has been reported by several different researchers working with several different bilingual populations (de Groot & Nas, 1991; Gollan, Forster, & Frost, 1997; Jiang, 1999; Keatley, Spinks, & de Gelder, 1994). Interestingly, masked translation priming has not been found in the reverse direction. Lexical decision times on L1 targets are unaffected by masked L2 translation equivalent primes (Gollan et al., 1997; Grainger & Frenck-Mestre, 1998; Jiang, 1999; Jiang & Forster, 2001; Keatley et al., 1994; Sanchez-Casas, Davis, & Garcia-Albea, 1992) unless the prime and target words are cognates from same-script languages (e.g., rich-rico) (de Groot & Nas, 1991; Sanchez-Casas et al., 1992).

In one of the first attempts to provide a mechanism for the translation priming asymmetry, Keatley et al. (1994) proposed a separate-interconnected model of bilingual lexical representation and processing. According to this model, the priming asymmetry is attributed to a stronger context effect provided by L1 representations. They propose that, relative to L2 representations, L1 representations exist in a much richer network of interrelated representations. As a result, L1 representations are capable of giving rise to much greater levels of activation within the L1 system, which, subsequently, can lead to activation across language systems. L2 representations, on the other hand, by virtue of existing in a network of weakly interconnected representations, are capable of creating only a small amount of activation within the L2 system and, hence, only a small cross-language priming effect (when one is noticeable at all).

A separate account of the translation priming asymmetry has been discussed by Kroll and Tokowicz (2001), who have argued that the revised hierarchical model (Kroll & Stewart, 1994) provides a straightforward account of the translation priming asymmetry. According to this account, translation priming is conceptually mediated and, in line with a central tenet of the revised hierarchical model, L2 lexical representations are only weakly connected to the conceptual system relative to their L1 counterparts. As such, priming is said to occur in the L1-L2 direction because the masked L1 prime is able to activate a shared conceptual node, which then preactivates the L2 translation-equivalent lexical form, thus facilitating recognition. Priming in the L2-L1 direction is not effective, though, because L2 primes do not automatically activate their conceptual representations, resulting in no preactivation of the L1 translation-equivalent form and thus no priming.

Both the account put forth by Keatley et al. (1994) as well as the account discussed by Kroll and Tokowicz (2001) assume a limiting factor (weak L2 interconnections and weak L2 form-meaning connection strengths respectively), such that L2-L1 priming either occurs with a particular population (when L2 connections are sufficiently strong) or it does not (when L2 connections are too weak). As such, there does not appear to be a straightforward way by which either one of these accounts could explain a task difference, where a single group exhibits L2-L1 priming effects in one task (e.g. semantic categorization) but not in another (e.g. lexical decision). In fact, there are two such examples in the literature. The first of these was reported by Grainger and Frenck-Mestre (1998), who found significant masked translation priming effects in the L2-L1 direction when semantic categorization

was used, but not when lexical decision was used. Recently, we have confirmed these findings with Japanese-English bilinguals (Finkbeiner, Forster, Nicol, & Nakamura, 2004). The second example of a task difference was reported by Jiang and Forster (2001), who found that Chinese-English bilinguals exhibited L2-L1 priming when an episodic recognition task was used, but not when lexical decision was used.

The recent findings that L2-L1 priming may be task dependent serve to impose new constraints on current models of bilingual lexical representation and processing. In particular, the existence of a task difference would demand an alternative account of the translation priming asymmetry from those presented in the revised hierarchical model (Kroll & Stewart, 1994) and the separate-interconnected model (Keatley et al., 1994). Neither one of those models can straightforwardly account for a task difference in L2-L1 translation priming because they both assume that weak L2 connections uniformly limit L2-L1 priming, regardless of the type of task used. Given the important implications that the possibility of a task dependent translation priming effect holds for current models of bilingual lexical processing, it is important to determine if the task dependent effect can be replicated. The purpose of this study is to replicate and investigate more closely the task-dependent priming effect reported by Jiang and Forster (2001).

Experiment 1

Jiang and Forster (2001) reported significant masked translation priming effects in the L2-L1 direction when an episodic recognition task was used, but not when lexical decision was used. Their episodic recognition task involved two separate phases. In the first phase, participants were asked to commit to memory a list of familiar Chinese (L1) words. In the second phase, participants had to indicate with a button press response as quickly as they could whether or not they had seen the Chinese word during the study phase. The targets in this speeded “old-new” task were preceded by masked English (L2) word primes. Half of these masked primes were the English translation equivalents of the targets and half were not. Quite surprisingly, participants responded faster to “old” targets when they were preceded by a translation-equivalent prime than they did when those same targets were preceded by a control prime. Participants did not exhibit a similar priming effect for the “new” targets.

In their explanation of these findings, Jiang and Forster (2001) appealed to a separate memory systems model. According to this account, the L1 lexicon is stored in lexical memory and the L2 lexicon is stored in episodic memory. A central tenet of their account is that lexical memory and episodic memory constitute distinct memory modules. Based on the principles of modularity (Fodor, 1985), Jiang and Forster (2001) suggest that “cross-module activation occurs only if information about the stimulus reaches consciousness” (p. 39). In so far as one is generally not aware of a masked stimulus, it would appear that Jiang and Forster assume no masked translation priming at all. Yet they report masked translation priming effects with an episodic recognition task. They account for this particular task difference by arguing that L2-L1 priming can occur when the overt response to the target is controlled by information coming from episodic memory (as it would be in an episodic recognition task) because both the prime (L2 word) and the episodic memory trace of the L1 target are represented within the same memory system. When responses are controlled by information coming from lexical memory (as they would be in a lexical decision task), the L2 prime is ineffective under masked conditions because information cannot cross memory systems without awareness. Given how the separate memory systems model is such a radical departure from current models of bilingual lexical processing, it is important to rule out alternative, and more parsimonious, explanations for the findings that Jiang and Forster (2001) have reported.

A critical finding in the Jiang and Forster (2001) paper was that L2-L1 priming was only observed in the old-new task when a long SOA (250 ms) was used (Experiment 1). When a short (50 ms) SOA was used (Experiment 3), they did not observe any priming. The authors argued that this provided support for the possibility that L2 stimuli take relatively long to process and that in order to observe any L2-L1 priming a sufficient amount of time must be allowed to elapse before the target is presented (c.f. Gollan et al., 1997, for a similar argument). It is typically the case in priming experiments that the target follows immediately after the prime, meaning that an SOA of 250 ms would require a 250 ms prime duration – the result of which would be a very visible prime. Jiang and Forster avoided this by

interpolating a backwards mask between the prime and the target. In their long SOA condition, the presentation sequence was as follows: first, a forward mask (#####) for 500 ms was presented, followed immediately by the prime for 50 ms, then a blank period for 50 ms, followed by a backward mask (#####) for 150 ms, and then finally the target for 500 ms. In the short SOA condition, the 50 ms blank period and the 150 ms backward mask were removed.

A potential problem with the presentation sequence in Jiang and Forster's long SOA condition was their use of a 50 ms blank period right after the prime because it allowed for the possibility of a "ghosting" effect. A ghosting effect can occur for short amounts of time and is characterized by the subjective experience that a particular stimulus is still on the screen even after it is no longer being presented. The presentation of distinct visual stimuli in immediate succession prevent ghosting effects. The consequence of a ghosting effect is that participants have available to them more time to become aware of the stimulus. With that in mind, it could be that the priming effect reported by Jiang and Forster was the result of participants engaging consciously controlled strategies – not automatic processes operating below the level of awareness. The present study was designed to investigate this possibility.

Experiment 1 is an L2-L2 repetition priming experiment. The purpose of this experiment is to determine whether or not participants can process masked L2 primes with a 250 ms SOA (same as Jiang and Forster's long SOA condition) without the interpolated 50 ms blank period. If participants exhibit a significant L2-L2 repetition priming effect, then it can be concluded that these participants are able to process L2 primes presented under these particular masking conditions.

Participants

Twenty Japanese-English bilinguals were recruited to participate in the study. All participants were native speakers of Japanese and were employed as graduate students at the University of Arizona. Participants had received a minimum of 6 years of English instruction while in Japan and at the time of testing all had been living in the United States for at least 2 years. All participants were paid for their participation.

Materials and Design

Eighty English words were used as critical items in Experiment 1. Half of these were abstract words and half were concrete words. Concreteness values were taken from the MRC psycholinguistic database (available on the web at http://www.psy.uwa.edu.au/mrcdatabase/uwa_mrc.htm). The abstract words had a mean concreteness value of 244.6 (on a scale of 100-700); the concrete words had a mean concreteness value of 592.6. The words were further divided on the basis of frequency. Half of the words were high frequency items (Mean frequency of 500 occurrences per million; Kucera & Francis, 1967) and half were low frequency items ($M=2.7$ occurrences per million). In sum, the eighty critical items consisted of 4 types: 20 high-frequency concrete items, 20 high-frequency abstract items, 20 low-frequency concrete items and 20 low-frequency abstract items. These particular stimuli were selected in an effort to see how closely our bilinguals' lexical performance patterned to that of native speakers. If the bilingual participants exhibited clear frequency and concreteness effects, we can be relatively sure that they are processing these items in largely the same way as native speakers.

Additionally, 80 prime-target pairs were selected with non-word targets to serve as the "No" responses. Nonwords were generated by the ARC Nonword Database (<http://www.maccs.mq.edu.au/~nwdb/>) such that all nonwords had orthographically existing onsets and bodies, as well as legal bigrams. Forty additional English words were selected to serve as control primes on the Word trials. The control primes were generated by the MRC Psycholinguistic Database and were matched with the repetition primes on word length, frequency and concreteness.

The critical targets were paired with two different primes: a repetition prime and a control prime. The repetition prime consisted of the same letter string as the target, but was presented in lowercase letters. The control prime was completely unrelated to the target except that it was matched with the target on length, frequency and concreteness. Two lists were constructed such that if a target was preceded by its repetition prime on List A, it was preceded by its control prime on List B and vice

versa. In this way, the materials were counterbalanced across the priming factor. No target word or prime word was repeated within lists.

Procedure

Each trial consisted of the following sequence: first, the participant was presented with a row of hashmarks (#####) for 500 ms. This forward mask serves two purposes. First, it lets participants know where on the screen the target will appear; second, it serves to mask the subsequently-presented prime. The forward mask was followed immediately by the prime word, which was presented in lowercase letters for 50 ms. The backwards mask followed immediately after the prime and was presented for 200ms. It, like the forward mask, consisted of a row of hashmarks, but differed from the forward mask in that it was presented in a different font (Arial Black as opposed to Times New Roman) and font size (size 18 as opposed to 11). Two perceptually distinct masks per item were used because when two identical masks are used, the prime contrasts sharply with the masks and appears to “pop out” during the presentation sequence. The target followed immediately after the backward mask; targets appeared in uppercase letters for 500 ms or until a participant made a response.

Participants were asked to indicate whether the target was a legal letter string in English by pressing either a YES button or a NO button. Stimuli were presented randomly, using the DMDX package developed at the University of Arizona by J.C. Forster (Forster & Forster, 2003). Response times (RTs) were recorded to the nearest millisecond.

Results

Two participants were excluded from analysis for failing to meet the 80% accuracy criterion. Additionally, 2 of the low-frequency abstract items had to be excluded from analysis because of exceptionally high error rates. In order to balance the design, two items were randomly selected and removed from each of the other word types. In this and the two subsequent experiments, incorrect responses were discarded, and outliers were treated by setting them equal to cutoffs established two SD units above and below the mean for each subject. The mean lexical decision times and percent error rates are presented in Table 1. For each comparison of interest, two analyses of variance were performed, one treating subjects as a random effect (F1), the other treating items as a random effect (F2). The factors were Word Type (abstract vs. concrete), Frequency (high vs. low), and Prime Type (identity vs. unrelated). The factor of Prime Type was a repeated measures factor in both analyses, but the factors of Frequency and Word Type were repeated in the subject analysis but not in the item analysis.

As Table 1 shows, there were clear main effects of word type, frequency and prime type. Participants exhibited a clear concreteness effect, responding on average 89 ms faster to concrete words than to abstract words. This difference was found to be highly reliable: $F(1,17)=15.48$,

	Word Type			
	<u>Abstract</u>		<u>Concrete</u>	
	<u>low-frequency</u>	<u>high-frequency</u>	<u>low-frequency</u>	<u>high-frequency</u>
control	990 (29)	659 (3)	860 (22)	630 (3)
prime	913 (33)	590 (2)	737 (16)	567 (2)
<i>priming effect</i>	77	69	123	63

Table 1: Mean lexical decision times (ms), percent error rates and priming effects for English (L2) targets as a function of word type in Experiment 1.

$F2(1,68)=12.67$. Likewise, participants exhibited a clear frequency effect. Mean response times were 263 ms faster for high-frequency items than they were for low-frequency items. Again, this difference was found to be highly reliable: $F1(1,17)=88.70$, $F2(1,68)=174.19$. Crucially, for the purposes of this first Experiment, participants exhibited a clear repetition priming effect (83 ms), which was found to be reliable in both the subject and items analyses: $F1(1,17)=18.95$, $F2(1,68)=25.67$. None of the interactions between factors reached significance.

Discussion

Taken together, these effects reveal that the bilinguals in this study were sensitive to manipulations of concreteness and frequency in the same way that native speakers have been found to be sensitive to these same manipulations. Furthermore, and more importantly for the purposes of this study, the present findings indicate that these participants were able to process L2 stimuli presented under these particular masking conditions. This was important as a first step in our investigation of the old-new effect reported by Jiang and Forster (2001). They argued that the reason they observed priming in their long but not short SOA condition was because participants did not have enough time to process the prime sufficiently in the short SOA condition. The present findings indicate that these particular participants were able to effectively process primes when presented under the masking conditions adopted in Experiment 1. Following from this, and the argument put forth by Jiang and Forster, the same participants should exhibit L2-L1 translation priming in the old-new task with this particular presentation sequence. Experiment 2 was designed to test this prediction.

Experiment 2

The purpose of Experiment 2 was to replicate the L2-L1 masked translation priming effect reported by Jiang and Forster (2001) in the old-new task. The one notable difference between the present experiment and that of Jiang and Forster's design was their use of the 50 ms blank period between the prime and backward mask. We chose not to include this blank period (one) because the findings of Experiment 1 indicated it was not necessary and (two) because of our concern that it may have led to a ghosting effect of the prime, which could have led to participants becoming aware of its presence. If participants were in fact aware of the prime's presence, we would have to entertain a very different explanation from the one put forth by Jiang and Forster. Namely, the priming effect that they reported may have been due to strategic processing as opposed to automatic processing. In so far as behavior associated with automatic processing is a preferred indicator of how the bilingual lexicon is organized, it is important to ensure that the priming effect reported by Jiang and Forster can be replicated under conditions that minimize participants' awareness of the prime.

Participants

The same 20 individuals participated in both Experiments 1 and 2 with an intervening period of two weeks between experiments.

Materials and Design

In order to ensure translation equivalency for each English-Japanese prime-target word pair, 5 Japanese-English bilinguals (from the same population as the participants in the experiment) were asked to translate a list of 150 items from English into Japanese (L2-L1); and another group of 5 was asked to translate the same items in the opposite direction (L1-L2). Only those word pairs that were translated identically in each direction by all participants were selected as critical items. Fifty-six word pairs met this criterion. Ten additional translation pairs were selected and used as practice items. All targets were presented in Kanji characters (the script that these words appear in normally) and care was taken to ensure that none of the Japanese targets shared cognate status with their English primes.

The 56 word pairs were divided into two sets (A & B) of 28 each. For half of the participants, the Japanese targets in set A were studied in the study phase and were the "old" items in the test phase.

For those participants, the targets in set B were the “new” items in the test phase. For the other half of the participants, the Japanese targets in set B were presented in the study phase and were the “old” items in the test phase; for these participants, the targets in set A were the “new” items in the test phase. Four presentation lists were constructed in order to counterbalance across the prime factor and the old-new status of the items. Half of the critical targets (both old and new) on each presentation list were paired with an English translation-equivalent prime and half were paired with an English control prime that was unrelated to the target. The control primes were matched with the translation-equivalent primes on length, frequency and concreteness. No prime word or target word was repeated within lists.

Procedure

There were two phases in this experiment. The first was the study phase. Here, participants were asked to study a list of 33 words for the purposes of a later recognition task. Twenty-eight of these were critical targets and 5 were practice items. Study items were presented on paper and participants were given as much time as they wanted to study them. When they felt comfortable with their memorization of the to-be-remembered items, they were given an initial recognition task on paper. In this initial task, they were asked to circle the words (out of a total of 150) that had appeared on the study list. If their accuracy was 90% or greater, they were asked to participate in the computer version of the recognition task. If they failed to meet the 90% accuracy criterion, they were asked to repeat the study phase.

In the test phase of the experiment, participants were asked to indicate as quickly as they could with a button press response whether the target had appeared on the study list or not. The same presentation sequence and presentation durations of the forward mask, prime, backward mask and target used in Experiment 1 was used in Experiment 2. Instructions, both oral and written, were given in Japanese by a native speaker. As such, participants were unaware of the bilingual nature of the task until during their debriefing.

Results

The mean old-new recognition times and error rates are presented in Table 2. Quite surprisingly, the effect of a masked translation-equivalent prime on episodic recognition times for targets, old and new, was negligible, and was not significant for either item type (both F_1 and $F_2 < 1$). Old items were responded to slightly slower than new items (9 ms), but this effect did not reach standard levels of significance. Similarly, an analysis of the error rates revealed no significant effects.

Discussion

The absence of a masked translation priming effect in the episodic recognition task stands in marked contrast to the effects reported by Jiang and Forster (2001) for their long SOA (250 ms) condition (Experiment 1). The absence of an effect in the present experiment patterns much closer to the short SOA (50 ms) condition (Experiment 3) in the Jiang and Forster paper, which they argued was attributable to participants being unable to process sufficiently the L2 prime. That argument does not hold in the present situation because we used a long SOA (250 ms), which, as we know from

	Item Type	
	<u>Old Targets</u>	<u>New Targets</u>
control	614 (7.5)	605 (4.2)
prime	614 (5.7)	604 (7.4)
<i>priming effect</i>	0	1

Table 2: Mean old-new recognition times (ms), percent error rates and priming effects for Japanese (L1) targets as a function of item type in Experiment 2.

Experiment 1, provides sufficient time for these particular participants to process effectively the masked L2 prime.

One possibility, of course, is that our participants did not understand how to perform the episodic recognition task. This seems unlikely, though, given the relatively fast reaction times and the low error rates. Another possibility, and one that seems much more likely, is that the 50 ms blank period interpolated between the prime and backward mask in the Jiang and Forster study led to awareness of the prime. If the blank period allowed participants to become aware of the prime and the bilingual nature of the task, they may have developed an expectation of the target based on the prime. This would have been especially true for old targets and could have led to a facilitation effect for those targets when they were translation equivalents of the primes. Experiment 3 of the present study was designed to investigate this possibility.

Experiment 3

The concern raised by the findings (or lack thereof) of Experiment 2 is that the original masked translation priming effect reported by Jiang and Forster (2001) may have been attributable to awareness of the prime, not the unique demands of the episodic recognition task. In the two episodic recognition experiments that have not included an interpolated blank period (Experiment 3 in the Jiang & Forster study; Experiment 2 in the present study), translation priming has not been observed. Experiment 2 in the present study, by using the same SOA that led to robust priming effects in Experiment 1, rules out the possibility that the lack of priming can be due to an insufficient amount of time for participants to process the prime. If the interpolated blank period is crucial to the masked translation priming effect in episodic recognition, then reinserting it into the presentation sequence should restore the priming effect. The strongest way to test the necessity of the blank period would be to conduct the test again with the same SOA (250 ms), the same items, and the same participants. This is what we did in the present experiment.

Participants

After a period of 6 months, twelve of same individuals who had participated in both Experiments 1 and 2 were located and recruited to participate in Experiment 3.

Materials and Design

The materials and design were the same as those used in Experiment 2.

Procedure

The only difference between Experiments 2 and 3 was in the presentation sequence of the stimuli. In experiment 2, the 50 ms prime was replaced immediately by a backward mask (200 ms), which was followed immediately by the target. In Experiment 3, a 50 ms blank period was interpolated between the prime and the backward mask. In order to keep the overall SOA constant at 250 ms, the duration of the backward mask was reduced to 150 ms. The overall sequence then was a forward mask for 500 ms, a 50 ms prime, a 50 ms blank period, and a 150 ms backward mask before the onset of the target, which was presented for 500 ms or until the participant responded.

Results

As in the previous experiments, incorrect responses were discarded, and outliers were treated by setting them equal to cutoffs established two SD units above and below the mean for each subject. The mean old-new recognition times and error rates are presented in Table 3. As is clear in Table 3, reinserting the 50 ms blank period between the prime and backward mask had a dramatic effect on participants' performance. Namely, the priming effect absent in Experiment 2 was restored. The main effect of priming (61 ms) was significant in both the subject and items analyses: $F(1,11)=5.43$,

	Item Type	
	<u>Old Targets</u>	<u>New Targets</u>
control	621 (8.3)	624 (7.1)
prime	554 (2.4)	569 (8.3)
<i>priming effect</i>	67	55

Table 3: Mean old-new recognition times (ms), percent error rates and priming effects in Experiment 3.

$F(2,154)=23.20$. The interaction between the factors word type (old vs. new) and prime type (translation vs. control) was not significant (all F s < 1), suggesting that both old and new targets alike exhibited a statistically equal amount of priming. This is very different from what Jiang and Forster reported; they observed priming for the old targets only. An analysis of the error data revealed no difference between error rates for old and new targets. Similar to the RT analysis, an analysis of the error rates revealed no interaction between word type and prime type.

Discussion

The results from the present experiment make it clear that the presence of the 50 ms blank period is critical to the L2-L1 translation priming effect in the old-new recognition task. The same participants (and materials) that failed to exhibit any priming in Experiment 2 exhibited robust priming effects in Experiment 3. The only difference between Experiments 2 and 3 was the use of the 50 ms blank period. Taken together, these findings are rather compelling in suggesting that the original priming effect reported by Jiang and Forster (2001) should be attributed to the presence of the 50 ms blank period used in their long SOA condition as opposed to the unique demands of the old-new recognition task. The implications that these findings have for the separate memory systems model will be taken up in the General Discussion.

General Discussion

The present study reveals that L2-L1 translation priming in the episodic recognition task depends upon the presence of a blank period between the prime and the target. In Experiment 2, no translation priming effect was observed despite using the same masking conditions that produced clear within-L2 repetition priming effects in Experiment 1. As such, it was considered unlikely that the lack of priming in Experiment 2 could be attributed to participants being unable to process effectively the masked primes. In Experiment 3, a 50 ms blank period was inserted between the prime and the backward mask (while keeping the same overall SOA used in Experiment 2), which was what Jiang and Forster had done in their study. In this experiment, the same participants who had not exhibited any priming in Experiment 2 exhibited robust L2-L1 priming effects. As such, it appears that the presence of a blank period between the prime and the target is critical to observe L2-L1 priming in the episodic recognition task. The episodic recognition task by itself does not appear sufficient to produce masked translation priming in the L2-L1 direction.

The present findings hold important implications for the separate memory systems model proposed by Jiang and Forster (2001). Crucial to the development of the separate memory systems model was the fundamental assumption that translation priming occurred in the episodic recognition task without participants being aware of the L2 primes. In order to explain the juxtaposition of a priming effect in episodic recognition with no priming in lexical decision, Jiang and Forster proposed the separate memory systems model, and argued that the task difference was the behavioral consequence of the organization of the bilingual lexicon. The present findings call this conclusion into question. It does not appear that the episodic recognition task is able to produce priming in the absence of awareness; as such, one of the fundamental assumptions of the separate memory systems model may be incorrect. If L2-L1 translation priming in the episodic recognition task depends upon

awareness of the prime, then it is not clear, with respect to the claims of the separate memory systems model, if priming in this task is different from priming in the lexical decision task (it is well established that awareness is needed to observe L2-L1 translation priming in lexical decision). Hence, the specific nature of the task difference between lexical decision and episodic recognition needs to be answered conclusively before we consider further the likelihood of the separate memory systems model.

Some initial insight may be gained from looking at the results of Experiment 1 in the Jiang and Forster paper. In that experiment, they report a 29 ms effect in episodic recognition and an 8 ms effect in lexical decision. Although the 8 ms effect did not reach significance, it appears that it may not have differed significantly from the 29 ms effect (evidence of a statistical interaction was not reported). Further work is clearly needed in this area to determine how, if at all, the episodic recognition task differs from the lexical decision task in revealing L2-L1 masked translation priming. The results of the present study suggest that in so far as awareness of the prime is needed in order to observe L2-L1 priming in episodic recognition, there may not be any substantial difference between the two tasks.

Conclusion

The purpose of this study was to replicate and investigate more closely the task dependent effect reported by Jiang and Forster (2001) in masked translation priming in the L2-L1 direction. In their study, they found priming in the episodic recognition task but not the lexical decision task. Based on this task difference, they proposed the separate memory systems model, which holds that the L2 lexicon is stored in episodic memory and that the L1 lexicon is stored in lexical memory. Consequently, they argued, the episodic recognition task is unique in its ability to reveal L2-L1 translation priming. Only with awareness of the prime can cross-module activation occur, which is argued to be the source of L2-L1 translation priming in lexical decision. Crucial to the Jiang and Forster account, then, is the assumption that masked L2-L1 priming can occur in the episodic recognition task without awareness of the prime. The findings of the present study challenge this assumption of the separate memory systems account by revealing that translation priming in episodic recognition depends upon some awareness of the prime. That is, L2-L1 masked translation priming was observed in the present study only when a 50 ms blank period was interpolated between the prime and the target. In so far as this blank period, which lends to awareness of the prime, is critical to observing a priming effect in episodic recognition, there is the suggestion that translation priming effects in lexical decision and episodic recognition may not differ from each other in kind. That is, the necessity of awareness diminishes the differences between the episodic recognition and lexical decision tasks and serves to weaken the separate memory systems account.

References

- de Groot, A. M., & Nas, G. L. (1991). Lexical representation of cognates and noncognates in compound bilinguals. *Journal of Memory & Language*, 30(1), 90-123.
- Finkbeiner, M., Forster, K. I., Nicol, J., & Nakamura, K. (2004). The role of polysemy in masked semantic and translation priming. *Journal of Memory & Language*, 51, 1-22.
- Fodor, J. A. (1985). *Precis of The Modularity of Mind*. Behavioral & Brain Sciences, 8(1), 1-42.
- Forster, K. I., & Forster, J. C. (2003). DMDX: A Windows display program with millisecond accuracy. *Behavior Research Methods, Instruments, & Computers*, 35(1), 116-124.
- Gollan, T. H., Forster, K. I., & Frost, R. (1997). Translation priming with different scripts: Masked priming with cognates and noncognates in Hebrew-English bilinguals. *Journal of Experimental Psychology: Learning, Memory, & Cognition*, 23(5), 1122-1139.
- Grainger, J., & Frenck-Mestre, C. (1998). Masked priming by translation equivalents in proficient bilinguals. *Language & Cognitive Processes*, 13(6), 601-623.
- Jiang, N. (1999). Testing processing explanations for the asymmetry in masked cross-language priming. *Bilingualism: Language & Cognition*, 2(1), 59-75.
- Jiang, N., & Forster, K. I. (2001). Cross-language priming asymmetries in lexical decision and episodic recognition. *Journal of Memory & Language*, 44(1), 32-51.

- Keatley, C. W., Spinks, J. A., & de Gelder, B. (1994). Asymmetrical cross-language priming effects. *Memory & Cognition*, 22(1), 70-84.
- Kroll, J. F., & Stewart, E. (1994). Category interference in translation and picture naming: Evidence for asymmetric connection between bilingual memory representations. *Journal of Memory & Language*, 33(2), 149-174.
- Kroll, J. F., & Tokowicz, N. (2001). The development of conceptual representation for words in a second language. In J. L. Nicol (Ed.), *One mind, two languages: Bilingual language processing* (pp. 49-71). Malden, MA: Blackwell.
- Sanchez-Casas, R. M., Davis, C. W., & Garcia-Albea, J. E. (1992). Bilingual lexical processing: Exploring the cognate/non-cognate distinction. *European Journal of Cognitive Psychology Special Issue: Multilingual community*, 4(4), 293-310.

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