

Cross-Language Masked Translation Priming in High- Proficiency Chinese-English Learners

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Abstract

How lexicon is represented in the mind in the bilinguals still attracts the scholars' interest. A variety of experiments, in different methodologies under different theoretical framework, were conducted, producing different results. This study used the data from Jiang (1999) to duplicate a masked translation lexical decision task experiment, aiming at examining the asymmetry effect in the proficient Chinese English learners studying in Singapore. The results did not show the existence of L1-L2 priming effect assured in the previous studies but see the L2-L1 priming effect as reported in Jiang (1999).

Keywords: Cross-language; Masked priming; Translation; High- proficiency; Chinese- English learners.



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1. Introduction

How lexicon is represented in the mind in the bilinguals still attracts the scholars' interest especially from the field of psychology and psycholinguistics. In the process of exploring the nature of this phenomenon, different theoretical frameworks were proposed such as The Revised Hierarchical Model (Kroll and Stewart, 1994), episodic L2 hypothesis (Jiang and Forster, 2001; Witzel and Forster, 2012) and the Sense Model (Finkbeiner *et al.*, 2004). Simultaneously, various research methodologies were implemented to examine these theories, among which, lexical decision tasks, semantic tasks are such paradigms frequently used in the experiments. Furthermore, these experiments would unavoidably produce some interesting results, like the asymmetry priming translation in cross-language users, that is, their L1 translation can prime their L2 while not vice versa. There were significant cases showing the strong translation priming asymmetry happening in cross language experiments via lexical decision tasks (Gollan *et al.*, 1997; Jiang, 1999; Jiang and Forster, 2001; Kim and Davis, 2003; Voga and Grainger, 2007). However, it should be noted that there indeed existed evidence, although limited, showing the L2 to L1 priming effect in the experiments (Basnight-Brown and Altarriba, 2007; Grainger and Frenck-Mestre, 1998; Jiang, 1999). Against the controversial context, this study used the data from Jiang (1999) to duplicate a masked translation lexical decision task experiment, aiming at examining the asymmetry effect in the proficient Chinese English learners studying in Singapore.

2. Literature Review

The frequently used masked translation prime paradigm originates from Forster and Davis (1984) in studying the processing and representation of bilingual languages. It starts by a forward mask (like a string of hash mark #####) for 500 milliseconds (ms), proceeding to the prime word for 50 ms followed by the target. The masking can assure the participants' unawareness to the prime word in that they would not be able to respond with other strategies. Besides, since the target immediately follows the prime, "responses to the target will be sensitive to the more dynamic processes triggered by the prime" (Kim and Davis, 2003). Therefore, comparing with other unmasked or non-subliminal priming, this way is said to minimize the effect of episodic and strategic factors (Kim and Davis, 2003; Sanchez-Casas and Garcia-Albea, 2005).

In lexical decision tasks, there are a great number of findings of masked translation priming asymmetry indicating that L1 translation priming could actively speed up the reaction time to the L2 target words while L2 could hardly or weakly activate L1. In a cross-language experiment, Gollan *et al.* (1997) selected both English-Hebrew and Hebrew-English bilinguals as their subjects, the result showed that the participants' L1 translation could significantly prime their L2. However, in the inverse direction, they failed to notice the translation priming effect.

This above experiment was duplicated by Jiang (1999), who used Chinese-English high proficiency bilinguals as his participants and validly select high frequent words as the stimuli. The result also proved a strong L1 to L2 translation priming effect as Gollan *et al.* (1997). In a follow-up research to the same kind of comparable Chinese-English bilinguals, Jiang and Forster (2001) received a significant L1 to L2 priming but failed to perceive such effect from L2 to L1.

In addition, other studies of translation prime by using lexical decision task can demonstrate the existence of translation prime in a variety of languages. De Groot and Nas (1991) focused on Dutch-English bilinguals, Kim and Davis (2003) paid attention to Korean-English bilinguals, Voga and Grainger (2007) explored Greek-English bilinguals, and Finkbeiner *et al.* (2004) were interested in Japanese-English bilinguals. All the studies, in the same pattern, showed the L1 to L2 translation priming with absence of the reverse.

However, it is worth noting that there were studies indicating the L2 to L1 translation prime with lexical decision task paradigm. For instance, Jiang (1999) indeed found a 13 ms weak L2 to L1 priming effect. What is more, in Grainger and French-Mestre (1998) experiment, although they failed to obtain L2 to L1 translation priming with a below 50ms stimulus onset asynchronies (SOAs) to test French–English bilinguals, they did find a “healthy trend” (p. 615) for L2 to L1 priming with a more commonly used (longer) SOA (57 ms). Another study conducted by Basnight-Brown and Altarriba (2007) with Spanish–English bilinguals uncovered significant priming effect in both the L1–L2 and the L2–L1 conditions. These studies, although limited in number, produce negative proof against the translation priming asymmetry.

Confronting a controversy in the cross-language experiment with lexical decision task regarding masked translation prime asymmetry, it is still needed to restore to consider the possibility of doing the experiment again to check such phenomenon. This project was to duplicate the previous experiment aiming at exploring whether there exists translation asymmetry in Chinese and English among a group of Chinese English scholars studying in Singapore with the following research question. Do high-proficiency Chinese English learners have translation asymmetry in masked priming lexical decision task?

3. Experiment

As is indicated above, the study was to duplicate the masked translation asymmetry experiment in lexical decision paradigm. The Chinese-English bilinguals were provided with both Chinese (L1)-English (L2) and English (L2) Chinese (L1) translation pairs to complete this priming experiment. Previous study in this aspect reached a consensus that L1 would prime L2 in all cases; however, the reverse is mixed, like the weak effect was discovered by Jiang (1999) (see literature review) with noncognates (Chinese vs. English).

4. Methodology

4.1. Participants

The participants were 8 English learners (5 female and 3 male) who worked on their master’s degree of applied linguistic program in National Institute of Education (NIE), Singapore. There were aged 32 to 35 years old. All of them have at least 10 years’ English learning history with high-level language ability (the high English requirement set by NIE also can prove their English ability). All participants signed a consent form to take part in this experiment and allowed the author to use the data collected for study.

4.2. Materials and Design

The critical stimuli (see Appendix) were from Jiang (1999) lists which were verified with validity. Among the 64 abstract translation pairs from Jiang (1999), 40 were randomly selected and equal number of 10 were used as L1-L2 prime and control, L2-L1 prime and control respectively; among the 32 unrelated Chinese primes, 20 were randomly selected as distracters; among the 32 unrelated English primes, again 20 were randomly selected as distracters (see Table 1).

Table-1. The English words and Chinese characters selected for experiment

	L1-L2			L2-L1		
	Prime	Control	Distracter	Prime	Control	Distracter
English	7	6.5	6.5	6.6	6.2	6.6
Chinese	2	2	2	2	2	2
Subtotal	10	10	20	10	10	20
Total	80					

Note: English was measured by word length (count letters). Chinese was measured by characters. Subtotal and Total were measured by words or characters.

Specifically, each direction included 10 primes, 10 controls, and 20 nonword distracters. This produced in total 80 translation pairs in use. Each English word (nonword) or Chinese noun (nonnoun) would appear only once.

Like Jiang (1999), the experiment adopted a 2 x 2 x 2 design with prime-target relation (prime, control), priming direction (L1-L2, L2-L1) and target lexicality (word, nonword) as within-participant factors.

4.3. Procedure

The experiment was conducted on a computer and operated with Psychopy, a free and open source software package, written in Python programming language for neuroscience and experimental psychology.

Each trial was conducted in order: first a mask (English was masked by ten hash marks (#####) and Chinese by five square block (■■■■■)) for 500ms, followed by the prime for 50ms, last with the target. All the stimuli were presented in the center of the computer screen randomly and set twice for collecting more accurate data. The participants were asked to decide whether the item appeared on the screen was a real word or meaningful Chinese noun or not and press the right arrow key for confirmation and left arrow key for disconfirmation as fast and accurately as possible. The Chinese instructions and practice trials were given before the experiment. After each trial, they participants were asked to comment on their perception in terms of the visibility of the prime, the flexibility of hand control on the arrows.

5. Results

For all 1280 (80 x 2 x 8) items of reaction time, first 640 (40 x 2 x 8) distracters were removed (the error rate was less than 10% indicating no participant guessed). What is more, 32 mistakes (5%) (see [table 3](#)) for all other participants were excluded. Next among the remaining 28 outliers (5%) whose value was ± 2 times standard deviation were trimmed out. At last 580 items of reaction time (correct response to real target) remained (see [Table 2](#)).

Table-2. Numbers of priming left for analysis

	L1-L2		L2-L1	
	Prime	Control	Prime	Control
	144	128	153	155
Total	580			

A one-way ANOVA was used in which reaction time as dependent variable and direction as factor. The reaction time in the two directions with cross language prime was listed in [Table 3](#). For L1 to L2 prime-target relation, it was reported with no statistically significant difference ($p < 1$) ($p = .963$). It should be noted that, however, there was indeed a 16 (ms) priming. In addition, the same trend happened to L2 to L1 prime-target relation without any statistically significant difference ($p < 1$) ($p = .903$) and there was a 6 (ms) priming reported.

Table-3. Participants' reaction time (ms) and error rates (%), in parentheses

	L1 to L2	L2 to L1
Prime	843 (0.8)	690 (1.1)
Control	859 (2.8)	696 (0.3)
Priming	16* (2)	6* (0.8)

Note: * significant at .05 level

The data above showed that in contrast to the previous studies which assured the existence of L1-L2 priming effect, this experiment did not produce the same result. However, in terms of the L2-L1 priming effect, this experiment could be in line with that of [Jiang \(1999\)](#) who reported a 13 (ms) priming in this direction. In other words, it failed to duplicate the previous studies significantly.

6. Discussion

This experiment followed a within-participant design which would collect the data in one integrated process successively rather than in different separated and dissucessive experiments. This design, to a large extent minimized the intra-experiment or inter-participant factors that may influence the result. Besides, the materials used were borrowed from [Jiang \(1999\)](#) stimuli which were justified. At the same time, the random selection of these words or Chinese nouns in the same length and figure of speech (both were abstract nouns) could assure the validity of the stimuli input.

Therefore, other factors regarding the participants and the operating process could be taken into consideration to explain the failure of this experiment. The number of participants was the first concern. There were only eight participants and it was possible that if one's data was in extreme, it definitely would affect the overall performance. Therefore, for a more reliable result, there should be more participants involving.

Besides, the response speed played a role. Although the participants were at nearly the same high proficiency level, it goes without saying that it would be impossible for everyone to keep the same reaction speed. Besides, their interest and affect could potentially influence their speed. Further, one participant said he was not used to pressing the arrow keys, which could slow down his reaction.

In addition, the sequence of the direction may matter. All trials followed L1 prime to L2 target and then L2 prime to L1 target flow. Although there were practice trials at the beginning, it was possible that the participants could still adjust themselves when proceeding to the follow-up stimuli, making the decision time in variance. It may be revised by equating the same number of L1-L2 and L2-L1 prime at the beginning of the trials.

7. Conclusion

This study aimed at providing more evidence to the masked translation asymmetry in lexical decision task. The duplication of the previous studies did not produce reliable result, making the experiment failed. However, its value should be emphasized that rather than the sound design and reliable resources, other factors should be taken into account, such as the numbers involving, the psychological and psychological condition of the participants and the sequence of the trials. In other words, a justified experiment result should be concerned in terms of all aspects rather than the experiment itself.

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Appendix: L1 to L2 and L2 to L1 Prime and Control Pair

L1 TO L2

PRIME PAIR (translation)		CONTROL PAIR(distracter)	
stimuli	target	Stimuli	target
改变	change	时间	enemy
工业	industry	季节	century
物理	physics	原因	structure
动物	animal	记录	control
能量	energy	重量	average
结果	result	帮助	news
讨论	discussion	历史	success
电视	television	重要	knowledge
速度	speed	支持	color
能力	ability	自由	need

L2 TO L1

PRIME PAIR (translation)		CONTROL PAIR(distracter)	
stimuli	target	stimuli	target
rest	休息	product	夏天
function	功能	yesterday	成员
country	国家	condition	化学
direction	方向	art	音乐
effort	努力	law	语言
question	问题	future	服务
thought	思想	education	目的
company	公司	report	市场
center	中心	death	冬天
method	方法	spring	平衡