Masked priming in picture naming and lexical selection

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Abstract

Our study focused on the co-activation of lexical nodes in bilinguals' speech production. We investigated whether the co-activated lexical forms compete for selection or not and whether language proficiency level would modulate the co-activation level in bilinguals. We tested the performance of Arabic-English bilinguals using the masked priming paradigm in a picture naming task. We found that the co-activated lexical forms do not compete for selection and that proficiency level does not affect the process of lexical selection.

Keywords: lexical selection, lexical access, speech production, different script

Introduction

Most theories of bilingual lexical access in speech production (Costa et al. 1999, Kroll and Stewart 1994, Poulisse and Bongaerts 1994) assume that lexical nodes in the target and non-target language are activated. Hence the question: if various nodes are activated how does the bilingual speaker select the target word? Two conflicting views emerged, namely the language non-specific view and the language specific view (for review, see Costa 2006). The language non-specific view assumes that lexical nodes in both languages are active and compete for selection, and there is an inhibitory mechanism (Inhibitory Control IC) that suppresses the activation of the lexical nodes in the non-target language (Green 1998, Hermans et al. 1998). On the other hand, the language specific view assumes that the lexical nodes in the target and non-target language are active, but only those in the target language are considered for lexical selection (Costa and Caramazza 1999, Costa et al. 1999).

The masked priming paradigm can be a suitable method in testing these theories. Inspired by Costa and Caramazza (1999), we used the identity condition to gain insights into the manner of language selection[1]. If pictures preceded by related masked primes in L1 were named faster than those preceded by unrelated masked primes, this would give evidence to the language specific view. In contrast, if longer naming latencies were found, this would give evidence to the language non-specific view as it would suggest competition between lexical nodes at the lexical level.

Method

Most studies on lexical access in bilingual speech production have tested bilinguals who speak languages that use the same script (the Roman alphabet). To the best of the author's knowledge, only a few studies have investigated the selectivity issue among bilinguals whose two languages have different scripts (Hoshino 2006, Jiang 2012). Therefore, to address the disagreement in the literature, we tested different script bilinguals (Arabic-English bilinguals) and we adopted the masked priming paradigm in picture naming as a new tool of investigation.

Participants

Sixty-Five Arabic-English bilinguals volunteered to participate and they were divided into two groups according to their level of proficiency.

Materials

Thirty white line-drawing picture of objects with non-cognate names were chosen. Two types of prime words were selected for each picture: (1) a prime word in L1 consisting of the translation word for the name of the picture, and 2) a prime word in L1 unrelated to the picture name. For example, a non-cognate picture of a bicycle was primed with the name of that picture in L1, i.e. the translation equivalent (دراجه- bicycle) in the related condition and with an unrelated prime (عنب – grapes) in L1 in the unrelated condition. Each participant was presented with 30 prime-target pairs (15 pictures with related primes and 15 with unrelated primes). The stimuli were counterbalanced across the two different prime conditions.

Design and procedures

The experiment was of a mixed design (i.e. a 2 x 2 design) with proficiency as the between subject factor and the prime type as the within the subject factors. Participants were tested individually and placed in front of high performing multimedia personal laptop, which had a 15" FHD screen and a resolution of 1920 x 1080 and the picture size was 300 x 300 cm. The responses of the subjects were recorded using an external electric microphone connected to the response device Chronos, which measures Response Times (RT). The experiment was designed using E-Prime 3.0 (i.e. a psychology software). Participants were informed that they were required to look at the centre of the screen and name the pictures as rapidly and accurately as possible, and to say 'pass' if they did not know the name of the picture. They were not informed of the presence of the primes. Each trial consisted of the following sequence of events: (1) the tests initially commenced with a fixation point (+), which appeared in the middle of the screen for 500 ms; (2) the appearance of a visual mask of (#####) symbols replaced the fixation point, which remained for 500 ms; (3) the appearance of a prime word (related or unrelated) for 50 ms on the screen; (4) a visual mask of (#####) symbols, which again appeared in the

centre of the screen for 14 ms; and (5) a target picture, which appeared and remained on the screen until the participants made a response.

Results

Reaction times (RTs) were calculated only for correct responses and those longer than the mean plus two standard deviations for a given subject in all conditions were not included in the analysis. A mixed ANOVA analysis was performed on the mean response latencies per subject with: a) proficiency level as a between-subject factor, and b) the relatedness nature of the prime word (related and unrelated prime words) as within-subject factors. A statistically significant main effect was found for the type of prime in both the analysis by subject F_1 (1, 26) = 23.851, $p < 0.05$ and the analysis by item F_2 (1, 29) = 5.145, $p < 0.05$. Pictures were named faster when they were preceded by masked related prime relative to unrelated prime. An insignificant interaction was found between the type of prime and proficiency level in both the analysis by subject F_1 (1,26) = 0.505, $p > 0.05$ and the analysis by item F_2 (1,29) = 3.7, $p > 0.05$ (figure 1). There was no significant main effect of proficiency level on the overall scores of reaction times in the analysis by subject $F_1(1,26) = .026$, $p > .05$ and in the analysis by item $F_2(1,29) = .064$, $p > .05$ (figure 2).
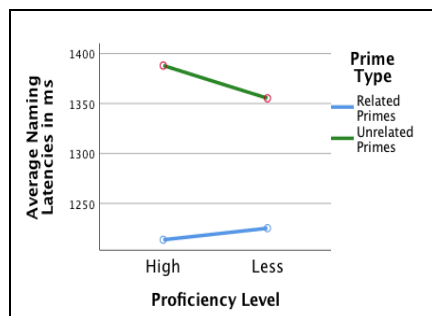

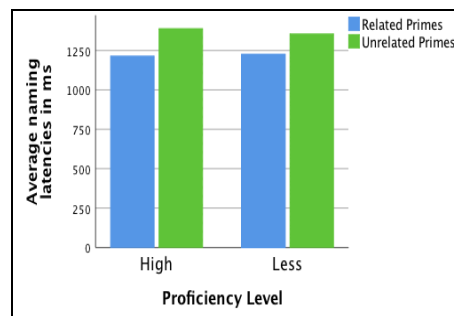Figure 1. The interaction between prime type and proficiency level.

Figure 2: Reaction times in the four conditions according to proficiency level.

General discussion

The purpose of this experiment was to investigate the lexical selection mechanism in Arabic-English adult bilinguals to determine whether it is language-specific or language non-specific and to investigate whether language proficiency level would affect the manner of language selection.

With regard to the first question, it was hypothesized that if the selection mechanism was language-specific, a facilitation effect in this critical condition would be noted. In contrast, if the selection mechanism was language non-

specific (selection by competition), an interference effect in the identity condition would be found. The results showed that naming non-cognate pictures in L2 produced a facilitation effect when preceded by masked related primes in the L1. Pictures preceded by related primes were named 152ms faster than those preceded by unrelated primes. Moreover, the performance of both highly and less proficient were similar in all conditions. The results thus demonstrated that lexical nodes in both target and non-target languages were active at the lexical level and did not compete for selection as no interference effect was observed. Also, proficiency level did not affect the manner of language selection.

Notes

1. The identity condition refers to the condition during which the distractor word is the translation equivalent of the picture to be named in a picture interference task (Costa et al., 2000).

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