

Priming bicultural bilingual Latino-Americans as Latino or American modulates access to the Spanish and English meaning of interlingual homographs

Benjamin Uel Marsh (Bmarsh@apu.edu)
Department of Psychology, 901 East Alost Avenue
Azusa, CA 91702

Jean-Paul Snijder
Department of Psychology, 901 East Alost Avenue
Azusa, CA 91702

Marina Pulver
Janna Schirmer
Ashley Horiuchi
Brandon Reynoso

Veronica Johnson
Hyun Seo Lee
Natalie Koskela
Raul Fajardo

Department of Psychology, 901 East Alost Avenue
Azusa, CA 91702

Abstract

Using Spanish-English bilingual Latino-Americans, this study tested whether priming Latino or American cultural representations facilitated the accessibility of the Spanish meaning or English meaning of Spanish-English homographs. Seventy-four participants were randomly assigned to a Latino prime, American prime, or no prime condition. After being primed, subjects performed an English lexical decision task wherein they indicated whether a letter string formed an English word. Homographs, English controls, and non-words were included in the array. As predicted, there was a significant prime condition by word type interaction, $F(2, 70) = 5.48$, $p = .006$, partial eta squared = .136, suggesting that prime condition modulated reaction times to homographs. Planned contrasts showed that participants in the Latino prime condition had slower reaction times to homographs than English controls, $F(1, 22) = 4.84$, $p = .039$, partial eta squared = .180, suggesting that the Latino prime facilitated access to homographs' Spanish meaning.

Keywords: Bilingual, Bicultural, Homographs, Semantic Representations, Cultural Representations

Introduction

Bicultural bilinguals are individuals who have been raised within two distinct sociocultural contexts wherein they acquire the common language and learn the defining features of each sociocultural context. The consequence of learning one language within one cultural context, and another language within a different cultural context is that the languages become preferentially linked to cultural representations that mentally represent the values, beliefs, expectations and other knowledge of the cultural context in which the language was acquired (Ross, Xun, & Wilson, 2002; Zhang, Morris, Cheng & Yap, 2013). This relationship is in part modeled by the modified hierarchical model (Pavlenko, 2009) where some concepts are depicted as being more accessible by one language than the other.

This asymmetrical relationship between concepts and L1 or L2 is in part dependent on which sociocultural context both languages were acquired. If bicultural bilinguals acquire L1 in one sociocultural context (C1) and L2 in a different context (C2), L1 and L2 may develop different intralingual patterns of conceptual associations and stronger links to cultural representations of the sociocultural context in which it was mostly acquired. More specifically, as discussed above, L1 would have stronger links to C1 than C2 representations, and L2 would have stronger links to C2 than C1 representations.

This relationship develops through habitual use of L1 to reference concepts associated with C1, and habitual use of L2 to reference the concepts associated with C2. For example, Jared, Pei Yun Poh, & Paivio (2013) recruited Mandarin-English bilinguals who were born in China and had lived there, on average for 15 years. These bilinguals were undergraduates in Canada and had lived there for an average of 5 years. Participants named aloud culturally-biased images of objects (e.g., image of a typical mailbox in China and a typical mailbox in Canada) in both Mandarin and English. Chinese culturally-biased images were named faster when using Mandarin than English, and Canadian culturally-biased images were named faster when using English than Mandarin. These findings suggest that some images along with their conceptual representation can be more strongly linked to one language than another. These Mandarin-English bilinguals likely learned to label the Chinese culturally-biased images using Mandarin and the Canadian culturally-biased images using English, resulting in stronger connections between Mandarin words and Chinese images and English words and Canadian images. Furthermore, these findings and other reviewed studies suggest an asymmetrical relationship between L1 and L2 lexical structures and C1 and C2 networks in that using one

language would prime the associated network of cultural representations, and activating a one network of cultural representations would prime lexical structures in the associated lexicon.

Research has shown that the language in which a task is performed influences which cultural representations become active. For example, Kimmelmeier and Cheng (2004) administered in English or Chinese an independent and interdependent self-construal scale to bilinguals in Hong Kong. They found that conceptual accessibility varied as a function of task language. Specifically, participants' who took the survey in English scored higher on the independent self-construal scale than those who took the survey in Chinese. This result suggests that performing the task in English facilitated access to concepts reflecting an independent self-construal that is common of Westerners than an interdependent self-construal that is common of East Asians. If processing L2 (L1) activates the concepts associated with C2 (C1), it is likely that the C2 network of cultural representations is also primed. As result, items encountered while using L2 (L1) are potentially being processed according to C2 (C1) representations (Chen & Bond, 2010; Kimmelmeier & Cheng, 2004; Ross, Xun, & Wilson, 2002).

Given that language use can facilitate the accessibility culture representations, one would assume that activating cultural representations could facilitate or inhibit lexical access (Jared, et al., 2013; Zhang, Morris, Cheng, & Yap, 2013). Zhang, Morris, Cheng, and Yap (2013) tested whether priming C1 representations directly interfered with L2 production by activating L1 structures. Their participants were coordinated Chinese-English bilinguals who had lived in the US 3 - 14 months. In Study 1, participants performed a computer-mediated conversation in where they listened to a pre-recorded speech about campus life while attending to a photograph of an American student (either Chinese or Caucasian face). After hearing the speech, participants verbally responded to the topic in English while being recorded. Compared to baseline measures, the participants showed decreased English fluency (number of words per minute) when speaking to a Chinese face compared to a Caucasian face. In Study 2, Zhang et al. (2013) found that English fluency significantly decreased when participants describe Chinese cultural icons (e.g., Great Wall) in English, but not when they described American cultural icons (e.g., Mount Rushmore) in English. These results suggest that viewing an individual or icon that represents C1, primes C1 representations and subsequently interferes with L2 production.

To assess whether C1 interference of L2 production was specifically through the activation of L1 lexical structures, Zhang et al. (Study 3) presented participants with pictures of objects with anomalous literal translations (e.g., In Chinese the literal translation of "Pistachios" is "Happy Nuts"). Participants were tested with name-recognition trials where

they judged whether the target English word/phrase identified the pictured object. Some words/phrases were English names like "pistachio" and others were Chinese literal translations like "happy nuts." In this study, the same prime technique from Study 2 was administered prior to the presentation of name recognition trials to assess whether a Chinese prime or American prime facilitated access to the Chinese literal translations or the American English name respectively. They found that Chinese icons facilitated the accessibility of Chinese literal translations, but American icons had no facilitating effects.

These results suggest that the presentation of nonlinguistic cultural cues (i.e., faces or cultural icons) activates C1 representations, primes L1 structures and subsequently interferes with L2 production. More specifically, activating C1 representations primes Chinese lexical structures that share more features with literal English translations (e.g., happy nuts) than the actual English referents (e.g., pistachio), making the literal translations more accessible than the English referents. The lack of facilitation by the American prime simply reveals the limited storing of American cultural representations that would activate English lexical forms.

Li, Yang, Scherf, and Li (2013) found similar results to Zhang et al. (2014), and that the activation of lexical structures by nonlinguistic cultural cues was reflected in neural activation patterns. Chinese-English bilinguals performed a picture-naming task in Chinese and English. In addition, objects to be named were presented with a Caucasian face, Chinese face, or no face. Participants performed the task twice: once inside a functional MRI to track activation of key brain regions during the different conditions (participants believed their naming reaction times were being recorded), and again outside of the fMRI to record naming reaction times. Li et al. (2013) found that picture naming was significantly faster in Chinese (subjects' L1) than English only when objects were paired with a Chinese face. Furthermore, fMRI data showed that the frontal and parietal brain regions received significantly larger clusters of activation when face and language pairings were congruent (e.g., Chinese face while naming in Chinese or Caucasian face while naming in English) than incongruent.

In light of the reviewed research, L1 and L2 facilitate access to different concepts and prime respectively C1 and C2 representations influencing how information is processed. Moreover, activating C1 and C2 representations primes respectively L1 and L2 structures influencing language production. Studies reviewed in this section, however, have only investigated the effects of nonlinguistic cultural cues on language production, and has not provided any evidence that nonlinguistic cultural cues would have similar effects in a language reception task (i.e. lexical decision task), an issue that is investigated in this study.

Current Study

The purpose of this study is to test whether priming cultural representations affects excitatory and inhibitory processes within a language reception task. It is common to use interlingual homographs to assess the excitatory and inhibitory processes of the bilingual language system. Both meanings of a homograph are activated in parallel, but the meaning irrelevant to the task is inhibited (Macizo, Bajo, & Martin, 2010). It is theorized here that the presentation of cultural icons influences the activation of L1 and L2 structures by sending excitation to language tags, as depicted in the Inhibitory Control model (Green, 1998), that control activation and inhibition of the target and non-target language respectively.

Using Latino-Americans who are English-Spanish bilinguals as participants, this study tests whether priming Latino (C2) and American (C1) cultural representations facilitate access to the Spanish (L2) homograph meaning and English (L1) homograph meaning respectively. Participants were shown either icons representative of Latino or American culture, or photographs of neutral scenes and asked to describe briefly each photograph. Afterwards, participants were presented with an English lexical decision task in which they decided whether a letter string formed a real English word. The array of letter strings included English control words, Spanish-English homographs, and non-words. Including only English words in the task facilitates the accessibility of the English homograph meaning limiting interference of the Spanish homograph meaning in lexical decisions to homographs (Dijkstra et al., 1998). Therefore, it is predicted that participants who describe neutral photographs will show no difference in lexical decision reaction time between homographs and English control words. Given the English context of the task and the assumption that American cultural icons will facilitate the accessibility of English, participants who describe American cultural icons are predicted to show no difference in lexical decision reaction time between homographs and English control words, and have faster lexical decisions to words than those who describe neutral photographs. In contrast, Latino cultural icons are predicted to facilitate the accessibility of Spanish. Therefore, participants who describe Latino cultural icons are predicted to have slower reactions times to homographs than English control words. Findings from this study may provide insight into how lexical structures and cultural representations are organized in semantic memory as well as practical implications for how bicultural bilinguals comprehend and encode written information.

Methods

Design and Participants

This study is a 3 (Prime condition: Latino prime, American prime, or No prime) x 2 (Word type: Homograph and English control word) mixed factorial design with prime condition as the between-subjects variable. Ninety-one

Spanish-English bilingual Latino-Americans were recruited from the Los Angeles Metropolitan area. There were three inclusion criteria: participants must be 18 years of age or older, a Spanish-English bilingual, and have at least one parent who is of Latino/Hispanic heritage. Eighteen participants were excluded for being a multivariate on Spanish or English proficiency scale or a univariate outlier in terms of the total number of excluded trials (e.g., errors, outliers, unrecognized homographs and their matched English control words) and reaction times to homographs, English controls, and non-words. Analyses were conducted using data from 73 (18 Male, 55 Female) participants. Participants' mean age was 20.03 years (SD = 2.75). The majority of participants were born in the US (n = 63, 86%), grew up in a home where both Spanish and English was spoken (n = 40, 55%), and indicated that they used English more often (n = 38, 52%) than Spanish (Table 1).

Table 1: Sample Frequencies for, Immigration Status, Home Language, and Language Use

	n (%)
Immigration Status	
US Born	63 (86)
Immigrant	9 (12)
Home Language	
English Only	5 (7)
Spanish Only	28 (38)
Both English/Spanish	40 (55)
Language Use	
English More	38 (52)
English/Spanish Equally	20 (27)
Spanish More	15 (21)

Materials

Priming icons A set of icons that represented American and Latino culture were selected to be used as cultural icons. The American icons included the following: Abraham Lincoln, Statue of Liberty, a depiction of the declaration of independence with words "We the People" visible sitting next to an American flag, burger and fries, and a football game. The Latino icons included the following: the Mexican flag, "Our Lady of Guadalupe", a soccer match, a plate of tamales, and a couple dancing a traditional Mexican dance. Some of the icons resemble those used in Lechuga (2008).

Homographs and English control words Forty interlingual homographs and 40 non-homograph English control words were taken from Macizo, Bajo, and Martin (2010). Eighty non-words were also included. Word frequency (number of times, on average, a word occurs in

written text) was matched for the English meaning of homographs ($M = 460.45$; $SD = 1357.72$), English translation of the Spanish meaning of homographs ($M = 410$; $SD = 1658$), and the English control words ($M = 444.83$; $SD = 1487.19$).

Language history and culture questionnaire A language history and culture questionnaire was used to assess participants' experience with and self-reported proficiency in Spanish and English, as well as participants' cultural identity. On this questionnaire, participants indicated basic demographic information (Age, Gender, Education level, childhood socioeconomic status, immigration status, and race/ethnicity). On the language history portion, participants indicated their first and second language, and the language most frequently spoken in their home during childhood. Participants indicated whether they use English or Spanish the most on a 7-point scale (1 = I use English the most; 7 = I use Spanish the most). Participants indicated how they learned English and Spanish on a 7-point scale (1 = Mostly through formal education; 7 = Mostly through interacting with people). Also, on a 7-point Likert scale (1 = Low; 7 = High) participants rated their Spanish and English proficiency in each of five areas: reading, spelling, writing, speaking, and speech comprehension. In addition, participants indicated how often they had read, heard, or used the Spanish meaning of each homograph on a 7-point Likert scale (0 = Not at all; 6 = Very Often). For each participant, the number of homographs responded to with a 0, indicating they did not recognize ever being exposed to the Spanish homograph meaning, were counted and recorded as a continuous variable (number of unrecognized homographs). After excluding unrecognized homographs, a homograph frequency of exposure rating was calculated on a 6-point scale (1 = Rarely; 6 = Very often) for each participant.

To assess the degree to which participants identified with Latino culture, the revised version of Phinney's (1992) multiethnic identity scale was included in the questionnaire. This version consists of 12 items rated on a 4 point Likert scale (1 = Strongly disagree; 4 = Strongly agree) from which an average score is calculated (Phinney, Romero, Nava, & Huang, 2001). In our study, the scale was adapted to a 7-point Likert scale (1 = Strongly disagree; 7 = Strongly agree) for symmetry with other scales on the questionnaire.

Procedure

Participants were randomly assigned to either the American prime, Latino prime, or no prime condition. They were told that the experiment involved a (a) photograph description task in which they would make descriptive responses to five photographs, (b) an English lexical decision task in which they indicated whether a presented letter string was an English word, and (c) a recognition task for the previously seen photographs. The experimental task was administered via a Macintosh desktop computer, and programmed using Super Lab software. The sequence of tasks started with

practice trials. Participants were seated approximately 23 inches from a computer monitor. For practice, participants were presented one neutral photograph to describe. After describing the practice photograph, participants performed 10 practice trials of the English lexical decision task. Each letter string remained on the screen until the participant provided a "Yes" or "No" response by pressing the "z" or "m" key respectively. Letter strings were separated by a 500ms screen with two fixation crosses in the center. After the practice trials, participants were verbally informed that for the test trials speed and accuracy were important and that they were to make their responses as quickly and accurately as possible. Participants in the American and Latino prime condition were presented five icons culturally relevant to their respective condition. In the No prime condition, participants saw five neutral photographs. After the priming task, participants were introduced to the test trials of the English lexical decision task. Participants performed 160 test trials of the English lexical decision task in random order for each participant. They were not informed that interlingual homographs were included. The reaction time for each lexical decision was recorded. Test trials were followed by a photograph recognition task that included the five previously seen photographs and 15 distracters.

Results

A series of Analysis of variance (ANOVA) on the percentage of excluded words and nonwords was conducted with prime condition as a factor. Prime conditions did not differ in the percentage of excluded words, $F(2, 70) = .610$, $p = .546$, partial eta squared = .017, and nonwords, $F(2, 70) = .820$, $p = .445$, partial eta squared = .023. On average, 16.40% ($SD = 9.7\%$) of words and 15.18% ($SD = 11\%$) of non-words had to be excluded due to errors, outliers, or unrecognized homographs.

A repeated measure ANOVA on participants' proficiency ratings was conducted with language (Spanish and English), proficiency type (reading, writing, speaking, spelling, and speech comprehension), and prime condition (No prime, Latino prime, or American prime) as factors. Means and standard deviations are presented in Table 2. Participants reported higher proficiency in English than Spanish, evident by the significant Language effect, $F(1, 70) = 109.30$, $p < .001$, partial eta squared = .610 and significant Language by proficiency interaction, $F(4, 178) = 19.92$, $p > .001$, partial eta squared = .222. The interaction among proficiency, language, and prime condition was not significant, $F(8, 136) = 1.12$, $p = .353$, partial eta squared = .062, suggesting that Spanish reading, writing, spelling, speaking, and speech comprehension did not differ respectively from English reading, writing, spelling, speaking, and speech comprehension among the prime conditions.

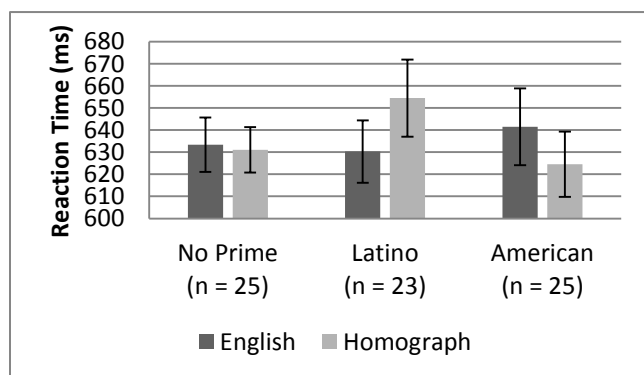
Table 2: Mean (and SD) Language Proficiency Ratings for each Proficiency Type by Prime Condition

Proficiency	No Prime	Latino Prime	American Prime
	M (SD)	M (SD)	M (SD)
Spanish			
Reading	5.19(1.54)	5.00(1.51)	4.84(1.28)
Spelling	4.30(1.63)	4.59(1.33)	4.48(1.26)
Writing	4.11(1.69)	4.36(1.52)	4.44(1.35)
Speaking	5.15(1.16)	5.45(1.71)	5.88(1.48)
Speech Comprehension	6.00(1.35)	5.73(1.48)	6.24(1.30)
English			
Reading	6.59(.572)	6.64(.492)	6.60(.707)
Spelling	6.19(.879)	6.32(.839)	6.24(.970)
Writing	6.15(.864)	6.45(.596)	6.44(.870)
Speaking	6.56(.641)	6.68(.568)	6.80(.500)
Speech Comprehension	6.59(.636)	6.73(.456)	6.84(.374)

Note. 1 = Low; 7 = High

Main Findings

As predicted, there was a significant prime condition by word type interaction, $F(2, 70) = 5.48, p = .006$, partial eta squared = .136 (Figure 1). Planned contrasts were conducted on reaction times to homographs and English control words for each prime condition. Participants in the Latino prime condition had slower reaction times to homographs ($M = 654.42; SD = 85.44$) than English controls ($M = 630.25; SD = 69.36$), $F(1, 22) = 4.84, p = .039$, partial eta squared = .180. There were no significant differences between reaction times to homographs and English controls for No prime condition, $F(1, 24) = .114, p = .739$, partial eta squared = .005, or American prime condition, $F(1, 24) = 4.13, p = .053$, partial eta squared = .147.



Note. Error bars are 95% confidence intervals

Figure 1: Mean reaction times to English words and interlingual homographs as a function of prime condition.

Discussion

The significant interaction of word type and prime condition on lexical decision time confirms that priming cultural representations affects accessibility of the target and non-target meaning of interlingual homographs. Participants in the Latino prime condition responded slower to homographs than English controls. This result is attributed to images reflecting aspects of Latino culture activating Latino cultural representations and the associated language, Spanish. Consequently, this process increased the accessibility of homograph's Spanish meaning and slowed lexical decisions for homographs. It is important to note that the null result in the no prime condition is a replication of the findings of Dijkstra (1998, experiment 1), suggesting that performing the task in an English context facilitated the accessibility of English limiting interference from the homographs' Spanish meaning. The American prime had a similar effect, in that its results are comparable to the no prime condition, suggesting the facilitation of access to the homograph's English meaning limiting interference from the Spanish meaning. In sum, the findings suggest that priming cultural representations modulates excitatory processes in the bilingual language system and that nonlinguistic cultural cues may aid in resolving competition for activation between L1 and L2 during a language reception task.

Variability in Bilingualism

In studies trying to modulate parallel processes in the bilingual language system, it is important to note that several factors have been found to influence interlingual activation such as: language proficiency and dominance (Basnight-Brown & Altarriba, 2007; Costa & Santesteban, 2004; Elston-Guttler, Paulmann, & Kotz, 2005), language history and the current language context in which the participants are immersed (Kroll, Bobb, & Wodniecka, 2006). As reviewed by Kroll and Bialystok (2013), bilingualism is not a simple categorical variable but instead a dynamic multidimensional interaction of linguistic, cognitive, social, experiential, educational, and other factors. This study along with others (Zhang et al., 2013 and Li et al., 2013) has found evidence for nonlinguistic cultural cues being another contextual factor that may influence excitation and inhibitory processes in the bilingual language system.

Conclusion

Language and culture are intertwined in that culture sanctions a particular way of understanding and associating entities in the environment and this occurrence influences the structure of language. Monocultural bilinguals, bicultural monolinguals, and bicultural bilinguals each represent a number of ways that cultural representations lexical structures can be organized in distinct yet linked networks. But, bicultural bilinguals provide a rare opportunity not only to study the intersection between language systems and networks of cultural representations, but also to understand the dynamic contextually driven

nature of this relationship that likely varies as a function of one's language and cultural history.

References

- Basnight-Brown, D. M., & Altarriba, J. (2007). Differences in semantic and translation priming across languages: The role of language direction and language dominance. *Memory and Cognition*, 35, 953-965. doi: 10.3758/BF03193468
- Costa, A., & Santesteban, M. (2004). Lexical access in bilingual speech production: Evidence from language switching in highly proficient bilinguals and L2 learners. *Journal of Memory and Language*, 50, 491-511. doi: 10.1016/j.jml.2004.02.002
- Dijkstra, T., Van Jaarsveld, H., & Ten Brinkle, S. (1998). Interlingual homograph recognition: Effect of task demands and language intermixing. *Bilingualism: Language, and Cognition*, 1, 51-66. doi: <http://dx.doi.org/10.1017/S1366728998000121>
- Elston-Güttler, K. E., Paulmann, S., & Kotz, S. A. (2005). Who's in control? Proficiency and L1 influence on L2 processing. *Journal of cognitive neuroscience*, 17, 1593-1610. doi: 10.1162/089892905774597245
- Green, D. W. (1998). Mental control of the bilingual lexico-semantic system. *Bilingualism: Language and Cognition*, 1, 67-81.
- Jared, D., Pei Yun Poh, R., & Paivio, A. (2013). L1 and L2 picture naming in Mandarin-English bilinguals: A test of Bilingual Dual Coding Theory. *Bilingualism: Language and Cognition*, 16, 383-396. doi:10.1017/S1366728912000685
- Kemmelmeier, M., & Cheng, B. Y. (2004). Language and self-construal priming: A replication and extension in a Hong Kong sample. *Journal of Cross-Cultural Psychology*, 35, 705-712. doi: 10.1177/0022022104270112
- Kroll, J. F., Bobb, S. C., & Wodniecka, Z. (2006). Language selectivity is the exception, not the rule: Arguments against a fixed locus of language selection in bilingual speech. *Bilingualism: Language and Cognition*, 9, 119-135. doi: 10.1017/S1366728906002483
- Li, Y., Yang, J., Suzanne Scherf, K., & Li, P. (2013). Two faces, two languages: An fMRI study of bilingual picture naming. *Brain and language*, 127, 452-462. doi: <http://dx.doi.org/10.1016/j.bandl.2013.09.005>
- Macizo, P., Bajo, T., & Martin, M. C. (2010). Inhibitory processes in bilingual language comprehension: Evidence from Spanish-English interlexical homographs. *Journal of Memory and Language*, 63, 232-244. doi:10.1016/j.jml.2010.04.002
- Pavlenko, A. (2009). Conceptual representation in the bilingual lexicon and second language vocabulary learning. In A. Pavlenko (ed.), *The Bilingual Mental Lexicon: Interdisciplinary Approaches Multilingual Matters*, Buffalo, NY.
- Ross, M., Xun, W. Q. E., Wilson, A. E. (2002). Language and the bicultural self. *Personality and Social Psychology Bulletin*, 28, 1040-1050. doi: 10.1177/01461672022811003
- Zhang, S., Morris, M., Cheng, C., & Yap, A. J. (2013). Heritage-culture images disrupt immigrants' second-language processing through triggering first-language interference. *Proceedings of the National Academy of Sciences of the United States of America*, 110, 1-6. doi: 10.1073/pnas.1304435110