The Effects of Word Frequency and Language Proficiency on Repetition Priming and Picture Naming

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THE EFFECTS OF WORD FREQUENCY AND LANGUAGE PROFICIENCY ON REPETITION PRIMING AND PICTURE NAMING

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by

Renee Michelle Penalver

2014
Dedication

To my mother whose affection, encouragement and unconditional love has motivated me to reach for more. To my grandmother for your endless support and love. To the rest of my family and friends for being my biggest cheerleaders.
THE EFFECTS OF WORD FREQUENCY AND LANGUAGE PROFICIENCY ON REPETITION PRIMING IN PICTURE NAMING

by

RENEE MICHELLE PENALVER, B.A.

THESIS

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Abstract

Frequency is known to modulate outcomes on tasks like picture naming. According to the frequency lag hypothesis there is a common mechanism for the effects of word frequency, language dominance and bilingual and monolingual differences in picture naming (Gollan, Montoya, Cera, & Sandoval, 2008; Gollan, Slattery, Goldenberg, Van Assche, Duyck, & Rayner, 2011). English monolinguals and English-Spanish bilinguals were tested on a picture naming task with pictures that had high and low frequency names. Response times, priming scores, and error rates were assessed. Response times indicated that monolinguals, and bilinguals were slower to respond to low frequency picture names than high frequency picture names. Also, monolinguals were faster at the picture naming task than bilinguals and bilinguals were faster in their dominant (L1) than non-dominant (L2) language. Priming scores indicated that monolinguals and bilinguals showed stronger priming for low frequency than high frequency picture names. Priming was stronger for bilingual L2 but not L1 compared to monolinguals. The effects of frequency and language on priming did not interact for bilinguals. However, frequency effects were stronger for bilinguals in L1 and L2 than for monolinguals. Error rates were higher for low frequency picture names than high frequency. Also, there were more errors for bilinguals than monolinguals, and more errors in bilingual L2 than L1. The results are discussed in terms of the frequency lag hypothesis. These findings provide support for the frequency-lag hypothesis in terms of the interaction of frequency and language on response times, but not for the interaction of frequency and language on priming for bilinguals.
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Chapter 1: Introduction

It is important to understand how bilingual experience affects basic language and memory processes. Bilinguals compose more than 50% of the world’s population (Harris & McGhee-Nelson, 1992). The frequency-lag hypothesis predicts that word frequency and language dominance will impact performance in word production. The focus of the present study is on bilingual language production and implicit memory processes, using a picture-naming task. Specifically, the impact of word frequency, bilingualism, language dominance, and repetition on picture naming were investigated. The primary questions of the current study were whether repetition priming in bilingual picture naming varies as a function of word frequency and whether the effects of word frequency on priming differ for a bilingual’s more and less proficient languages.

Language production in monolingual and bilingual individuals is often investigated using a picture-naming task, in which pictures of common objects are presented, one at a time, and participants must produce a single label for each object. Picture naming is a task that can be used to investigate lexical access and memory in bilinguals. It is believed to involve three discrete processes (Johnson, Paivio, & Clark, 1996) that are completed sequentially. The first process is object recognition, which involves a set of perceptual processes used to identify the object. The second process is retrieval of the phonological word form, which involves finding the appropriate word for the object. The final process is generation of the appropriate response, which involves motor articulation of the appropriate phonology.
1.1 Word Frequency

Word frequency is an index of the experience that a person has likely had with a word in his or her language. It is an important factor to consider for the bilingual experience because it modulates outcomes like response times and accuracy scores on word comprehension tasks such as lexical decision (Forster & Davis, 1984) and word production tasks such as picture naming (Wheeldon & Monsell, 1992), because words that are frequently used are easier to lexically access than words that are not as frequently used. Specifically, low-frequency words exhibit slower and less accurate responses than high-frequency words on lexical decision and picture naming tasks (Forster & Davis, 1984; Gollan et al., 2008; Wheeldon & Monsell, 1992).

1.2 Language Dominance

Language experience is also reflected by a person’s language dominance. The language in which a bilingual individual has more experience and is, therefore, more proficient is the dominant language (L1), while language in which he or she has less experience and proficiency is the non-dominant language (L2). Like word frequency, language proficiency affects response times and accuracy on comprehension tasks such as semantic classification (Potter et al., 1984) and production tasks such as picture naming (Potter et al., 1984). Specifically, responding to L2 words leads to slower and less accurate performance than responding to L1 words. A person who only speaks one language has more experience in that language than a bilingual person has in either of the two languages spoken, and accordingly names pictures faster and more accurately than a bilingual does in either their L1 or L2 (Gollan et al., 2005; Gollan et al., 2008). Previous research with high and low frequency words
suggests that for bilinguals in some situations, words in their L2 are processed like LF words in their L1 or like LF words are processed by monolinguals (Francis & Gutierrez, 2012; Francis & Stroback, 2013; Gollan et al., 2008).

1.3 The Frequency- Lag Hypothesis

The frequency-lag hypothesis proposes a common mechanism for word frequency effects, language dominance effects, and bilingual-monolingual differences in a picture naming task (Gollan, Montoya, Cera & Sandoval, 2008; Gollan et al., 2011). Specifically, LF words are proposed to be more weakly linked to their conceptual representations than HF words and L2 words are more weakly linked to their conceptual representations than L1 words. Similarly, words are more weakly linked to their conceptual representations in bilinguals than in monolinguals. This is because bilinguals speak two languages and therefore must divide the frequency of use of words in each language compared to a monolingual. This suggests that more frequent use and repetition will provide stronger word accessibility in speakers. This hypothesis implies that bilinguals are disadvantaged on language tasks that require word production. These disadvantages are represented in response times and accuracy scores on specific cognitive tasks. This disadvantage is believed to occur at the level of lexical access, the level where frequency modulates performance. As bilinguals begin using their second language more frequently, lexical representation and access to the words gets stronger. The access to words get stronger because practice with semantics and phonology becomes stronger over time with repetition. A key prediction of the frequency-lag hypothesis is that frequency effects in picture naming are larger in L2 than in L1 and larger in bilinguals than in monolinguals (Gollan, Montoya, Cera & Sandoval, 2008).
1.4 Repetition Priming

When a task is repeated, it can be completed faster in subsequent trials because with practice the component processes are speeded up. Response times for picture naming became faster when prior presentations of the same picture have appeared (Durso & Johnson, 1979). Successive repetitions of the stimulus decrease response time (Bartram, 1974). Both object identification and retrieval of the phonological word form are speeded up with repetition, but articulation of the phonology does not improve with repetition (Francis, 2014).

Repetition priming in picture naming is affected by both word frequency and bilingual language experience. Repetition effects are greater for pictures with LF names than for pictures with HF names for monolinguals (Wheeldon & Monsell, 1992). Thus, although there are reaction time advantages for HF words, there is stronger priming for LF words. One interpretation is that it typically takes longer to name pictures with LF names and therefore with repetition there is more room for RT to decrease.

Previous research has indicated that there are larger repetition priming effects in picture naming for L2 than L1 (Francis et al, 2008). Priming in picture naming is also stronger for bilinguals than for monolinguals (Francis et al., 2008; Gollan et al., 2005). L2 takes longer to respond to than L1, because of this it allows responses in L2 to become faster with repetition of a stimulus. L2 words are similar to LF words and L1 words to HF words, in that L2 would show larger repetition priming effects than L1 words because there is more room for RT to decrease with practice. This allows L2 to improve to catch up with L1 with practice on picture naming performance. Repetition priming of picture naming also gives bilinguals a chance to improve relative to monolinguals in response times and accuracy performance (Gollan et al., 2008).
Since frequency and language dominance modulate the degree of priming as well as picture naming RTs in L1 and L2, it is likely that frequency effects in repetition priming will be stronger in L2 than L1. According to the frequency lag hypothesis (Gollan et al., 2011), this should be the case in picture naming because frequency effects are shown to be robust in production tasks like picture naming. There should be stronger frequency effects for bilinguals in comparison to monolinguals and stronger frequency effects for L2 than for L1 in the picture naming task.

1.5 The Present Study

1.5.1 Predictions

The present research will test six key questions, based on the frequency lag hypothesis.
1) Are bilinguals at a disadvantage relative to monolinguals on production tasks such as picture naming? Based on previous research (Gollan et al., 2008; Francis et al., 2008), it was predicted that bilinguals would be slower and less accurate than their monolingual counterparts, and slower and less accurate in L2 than in L1. 2) Do bilinguals show larger frequency effects than monolinguals, and larger frequency effects for L2 than L1? We expect that bilinguals will show larger frequency effects than monolinguals because bilinguals have used words in each language less often than monolinguals (Gollan et al., 2008). 3) Is there more priming for LF words than for HF words in picture naming? Based on one previous study (Wheeldon & Monsell, 1992) there should be more priming for LF words than for HF words. 4) Is there more priming for L2 than L1 in picture naming and more priming for bilingual L1 than for monolinguals? Based on previous research there is expected to be greater priming for the L2 than L1 (Francis et al., 2008). These four questions are questions
that have already been addressed in previous literature, but warrant replication. Here, these effects were tested in bilinguals for the first time.

The fifth and sixth questions are unique to the present study. These questions focus on the frequency effect on priming for bilinguals in L1 and L2. 5) Are the effects of frequency on priming stronger in L1 or L2? It was anticipated that the effects of frequency on priming would be stronger in L2 than in L1. 6) Are the effects of frequency on priming stronger in monolinguals or bilinguals? It was anticipated that the effects of frequency on priming would be stronger in bilinguals than monolinguals.

We can further understand bilingual language production by testing the frequency-lag hypothesis. Here, we are testing the frequency and language dominance interaction on priming, which has never been studied in the literature. By testing this hypothesis we can learn more about the nature of language use, lexical access, and implicit memory processes and contribute to the literature in these areas.
Chapter 2: Experiment

Participants were tested on a picture-naming task. Participants were asked to name pictures whose labels were of high and low frequency at study and test. Half of the pictures from study were repeated at test and half were new pictures that had not been presented to the participant before. Participants saw mixed high and low frequency pictures at study and at test. Bilinguals were asked to name pictures in English and Spanish. English monolinguals were asked to name pictures only in English.

2.1 Method

2.1.1 Participants

Based on a power analysis of a medium size effect, it was anticipated that a total of 128 participants would be needed for this study. We recruited three different groups: 32 Spanish-dominant bilinguals, 32 English-dominant bilinguals, and 64 English-speaking monolinguals. Participants were classified as bilingual or monolingual and as English or Spanish dominant based on self-reported proficiency using the Language Background Questionnaire. Background information about participants is located in Table 1.1. Participants were recruited from the University of Texas at El Paso Psychology participant pool (recruitment was through the SONA system). Participants were compensated with one hour of SONA credit or ten dollars for their participation.
Table 1.1: Self-Report Language Background Summary

Language Background Data

<table>
<thead>
<tr>
<th>Dominant</th>
<th>English Monolingual (n=64)</th>
<th>English Dominant (n=32)</th>
<th>Spanish (n=32)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Age</td>
<td>25</td>
<td>25</td>
<td>23</td>
</tr>
<tr>
<td>Age of Acquisition E</td>
<td>1.6</td>
<td>3.5</td>
<td>8.5</td>
</tr>
<tr>
<td>Age of Acquisition S</td>
<td>7.5</td>
<td>2</td>
<td>1.5</td>
</tr>
<tr>
<td>Formal Education E</td>
<td>14</td>
<td>15</td>
<td>9.9</td>
</tr>
<tr>
<td>Formal Education S</td>
<td>3.5</td>
<td>2.5</td>
<td>6.9</td>
</tr>
<tr>
<td>Reading Proficiency E</td>
<td>88%</td>
<td>87%</td>
<td>85%</td>
</tr>
<tr>
<td>Reading Proficiency S</td>
<td>21%</td>
<td>74%</td>
<td>85%</td>
</tr>
<tr>
<td>Exposure E</td>
<td>94.5%</td>
<td>76%</td>
<td>60%</td>
</tr>
<tr>
<td>Exposure S</td>
<td>4.15%</td>
<td>19.25%</td>
<td>33.5%</td>
</tr>
</tbody>
</table>

2.1.2 Materials

Stimuli

The stimuli selected for the picture-naming task were 120 pictures from the Snodgrass and Vanderwart (1980) picture set, including 60 pictures with HF names and 60 pictures with LF names. The HF and LF picture sets were each randomly divided into two sets of 30 items that were presented in one or the other language. Thus, each bilingual participant named 30
HF pictures in English, 30 LF pictures in English, 30 HF pictures in Spanish, and 30 LF pictures in Spanish. Each monolingual participant had two English blocks. Each block consisted of 30 HF pictures and 30 LF pictures. The assignment of pictures to languages was counterbalanced across participants.

The frequencies of the names of the pictures were matched with the word frequency norms in English and in Spanish. The CELEX (Baayen, Piepenbrock & Van Run, 1995) norms were used for the English language and the Alameda and Cuetos (Alameda & Cuetos, 1995) norms were used for the Spanish language. For high frequency words we used frequencies of 25 per million and above in each language. For low frequency words we used frequencies of 15 per million or below in each language. We needed 120 stimuli, and to get the required stimuli we used these frequencies for high and low frequency picture names.

2.1.3 Design

This study had a 2 (language) x 2 (word frequency) x 2 (item status) design. The first independent variable was the naming language, English or Spanish. The second independent variable was word frequency, low frequency or high frequency. The third independent variable was item status, new items or repeated items at test phase. The outcome measures for the picture-naming task were response time and accuracy scores.

2.1.4 Measures

Language Background Questionnaire

This is a multiple-item untimed self-report questionnaire that gathers general information about different dimensions of the language history of the participant. The items include information on age of acquisition of each language, information regarding the proficiency of languages other than English and Spanish, information regarding where the participant has lived.
(US, Mexico, or other Spanish speaking country), family language usage, social language usage, educational language usage, self-rated proficiency levels on reading, writing, and speaking in each language and other general language background information. Summary information is provided in Table 1.1.

**Demographic Background Questionnaire**

This is a multiple item untimed questionnaire that gathers general background and demographic information about the participant. This questionnaire gathers general information on age, sex, ethnicity, education level, family education level, family size and family income.

### 2.1.5 Procedure

Participants completed an informed consent form. Then they completed the Language Background Questionnaire and the Demographic Background Questionnaire. The questionnaires took no longer than 25 minutes for participants to complete. These questionnaires helped to indicate the language dominance of the participant.

Participants completed the questionnaires. They sat arm’s distance away from the monitor. Then they completed the experimental picture-naming task.

For the picture naming task there was an encoding and test phase. In the encoding phase, bilingual participants were presented with a LF English block, HF English block, LF Spanish block, and HF Spanish block. Each block consisted of 15 items. In the test phase, bilingual participants were presented with a LF English block and HF English block and LF Spanish block and HF Spanish block. Each block contained 15 new items and 15 repeated
items, with the new and repeated items presented in a random sequence within each block. Order of the blocks was counterbalanced across participants.

In the encoding phase, monolingual participants were presented with a LF English block and a HF English block, with 30 trials per block. In the test phase monolingual participants were presented with a LF English block and HF English block. Each test phase block consisted of 30 new items and 30 repeated items, with new and repeated items presented in a random sequence within each block. Frequency block order was counterbalanced across participants. Participants completed the experiment in 1 hour or less and were debriefed after participation.

2.1.6 Apparatus

The experiment was displayed on an iMac desktop computer with a 17” screen. The experiment was presented using PsyScope experiment software.

2.2 Results

Data Processing for Response Times.

Analyses focused on response times and accuracy scores in the test phase. For the response-time analysis, trials on which response errors were made were excluded. Also, trials with RTs under 200 ms or over 5,000 ms were excluded, because appropriate responses cannot be made under 200 ms or above 5,000 ms.

Response Times.

We examined with a set of planned paired-samples t-tests response time differences at study for high and low frequency words at study for bilinguals and for monolinguals (see Figure 1.1). For monolinguals, response times were significantly longer for low frequency words than for high frequency words, \( t(63) = 4.63, p < .001 \). Response times for bilinguals at
study in their dominant language were longer for low frequency words than for high frequency words, \( t(63) = 6.40, p < .001 \). Response times for bilinguals at study in their non-dominant language were longer for low frequency words than for high frequency words, \( t(63) = 9.33, p < .001 \).

A 2 (frequency) x 2 (language) repeated measures analysis of variance was performed on response times to compare bilingual’s dominant and non-dominant languages from the test phase. There was a main effect of language \( F(1, 63) = 42.02, MSE = 177638.97, p < .001 \), indicating longer response times for words in bilinguals’ non-dominant language than the dominant language. There was a main effect of frequency \( F(1, 63) = 139.79, MSE = 49944.04, p < .001 \), indicating slower response times for low frequency words than high frequency words. There was also a significant interaction of language by frequency, \( F(1, 63) = 14.853, MSE = 59437.532, p < .001 \), indicating that the frequency effect was stronger for bilinguals responding in their L2 than in their L1.

A 2 (group) x 2 (frequency) mixed analysis of variance was performed on response times at study to compare bilingual performance in L1 to monolingual performance. There was a main effect of group, \( F(1, 126) = 61.95, MSE = 1556575.31, p < .001 \), indicating that bilinguals took longer to name pictures in their L1 than monolinguals took to name pictures in English. There was a main effect of frequency \( F(1, 126) = 61.95, MSE = 25125.771, p < .001 \), indicating higher response times for high frequency word names than low frequency word names. There was also an interaction of group by frequency, \( F(1, 126) = 8.24, MSE = 14628.97, p = .005 \), indicating that the frequency effect was stronger in bilinguals responding in L1 than in monolinguals.

A 2 (group) x 2 (frequency) mixed analysis of variance was performed on response times to compare monolinguals and bilinguals responding in L2. There was a main effect of group,
\( F(1, 126) = 44.01, \text{MSE} = 1945166.13, p < .001 \), indicating that bilinguals took longer to name pictures in their L2 than monolinguals took to name pictures in their only language. There was a main effect of frequency, \( F(1, 126) = 108.25, \text{MSE} = 44193.99, p < .001 \), indicating longer response times for low frequency than high frequency names. The interaction of group and frequency was significant, \( F(1, 126) = 44.01, \text{MSE} = 44193.99, p < .001 \), indicating that the frequency effect was stronger in bilinguals responding in L2 than in monolinguals.

![Study Phase RT as a function of Frequency and Language Dominance](image)

Figure 1.1: Response times during Study phase as a function of Frequency and Language
Dominance

Priming.

Priming scores were obtained by subtracting the response times for old (repeated) words at test from the response times for new words at test. Paired sample t-tests were performed to determine whether there was significantly more priming for low frequency than high frequency words. Within monolinguals priming was significantly greater for low frequency words than high frequency words, \( t(63) = 2.33, p = .023 \). Priming in bilinguals’ dominant language was stronger for low frequency than high frequency words, \( t(63) = 6.38, p < .001 \). Priming in bilinguals’ non-dominant language was also significantly stronger for low frequency than high frequency words, \( t(63) = 9.33, p < .001 \).

A 2 (language) x 2 (frequency) repeated measures analysis of variance was performed on priming scores comparing the bilinguals’ dominant and non-dominant languages. There was a main effect of frequency on priming, \( F(1, 63) = 9.56, MSE = 100177.45, p = .003 \), indicating that there was stronger priming for low frequency words than high frequency words. There was a main effect of language, \( F(1, 63) = 15.26, MSE = 79394.76, p < .001 \), indicating that there was stronger priming for L2 than L1. The interaction of language by frequency was not significant, \( F(1, 63) = 1.57, MSE = 74082.58, p = .221 \), indicating that the frequency effect did not differ for L1 and L2.

A 2 (group) x 2 (frequency) mixed analysis of variance was performed on priming scores for monolinguals and bilinguals responding in their dominant language. There was no main effect of group, \( F(1, 126) = 1.16, MSE = 3218730.61, p = .284 \), indicating that bilinguals did not have stronger priming in their L1 than monolinguals in their only language. There was a main
effect of frequency, $F(1, 126) = 61.95, MSE = 25125.77, p < .001$, indicating stronger priming for low frequency names than high frequency names. The frequency by group priming interaction was significant, $F(1, 126) = 8.24, MSE = 25125.77, p = .005$, indicating that the frequency effect was stronger in bilinguals responding in L1 than in monolinguals.

A 2 (group) x 2 (frequency) mixed analysis of variance was performed on priming scores for monolinguals and bilinguals responding in their non-dominant language. There was a main effect of group, $F(1, 126) = 5.09, MSE = 284381.07, p = .026$, indicating that there was stronger priming for bilinguals responding in L2 than monolinguals. There was a main effect of frequency, $F(1, 126) = 14.61, MSE = 55876.145, p < .001$, indicating stronger priming for low frequency object names than high frequency object names. The frequency by group priming interaction was significant, $F(1, 126) = 5.09, MSE = 555876.15, p = .026$, indicating that the frequency effect was stronger in bilinguals responding in L2 than in monolinguals.
**Error Rates.** Two-tailed planned paired-samples t-tests were conducted to look at error rate differences for high and low frequency words in monolinguals and bilinguals (see Figure 3.1). For monolinguals, there were significantly more errors for low frequency picture names than high frequency picture names, \( t(63) = 7.63, p < .001 \). For bilinguals responding in L1, there were significantly more errors in LF than in HF picture names, \( t(63) = 18.54, p < .001 \). For bilinguals responding in L2, there were significantly more errors for LF than in HF picture names, \( t(63) = 14.08, p < .001 \).

A 2 (frequency) x 2 (language) repeated measures analysis of variance was performed on error rates to compare bilingual’s dominant and non-dominant languages. There was a main effect of language \( F(1, 63) = 185.48, MSE = 185.482, p < .001 \), indicating more errors
for bilinguals non-dominant language than the dominant language. There was a main effect of frequency $F(1, 63) = 55.20, MSE = 544.50, p < .001$, indicating more errors for low frequency words than high frequency words. The interaction of language and frequency was not significant, $F(1, 63) = .966, MSE = 11.391, p = .329$, indicating that the frequency effect on error rates did not differ for bilingual participants’ two languages.

A 2 (group) x 2 (frequency) mixed analysis of variance was performed on error rates to compare bilingual performance in L1 to monolingual performance. There was a main effect of group, $F(1, 126) = 20.638, MSE = 305.25, p < .001$, indicating that bilinguals had more errors in naming in L1 than monolinguals had in their only language. There was a main effect of frequency $F(1, 126) = 108.98, MSE = 848.266, p < .001$, indicating more errors for high frequency word names than low frequency word names. There was no interaction of group by frequency, $F(1, 126) = 1.93, MSE = 15.02, p = .167$, indicating that the frequency effect did not differ for bilinguals responding in their L1 and monolinguals.

A 2 (group) x 2 (frequency) mixed analysis of variance was performed on error rates to compare monolinguals and bilinguals responding in L2. There was not a main effect of group, $F(1, 126) = 1.672, MSE = 31.64, p = .198$, indicating that bilinguals did not have more errors in naming in their L2 than monolinguals had in their only language. There was a main effect of frequency, $F(1, 126) = 112.250, MSE = 1056.250, p < .001$, indicating more errors for low frequency than high frequency names. The interaction of group and frequency was significant, $F(1, 126) = 5.621, MSE = 52.562, p = .019$, indicating that there was a larger frequency effect for bilinguals responding in L2 than for monolinguals.
2.3 General Discussion

Bilinguals were slower and less accurate than their monolingual counterparts, and slower and less accurate in L2 than L1 on the picture naming task. Bilinguals showed larger frequency effects in picture naming in both L1 and L2, as compared with monolinguals, and larger frequency effects in L2 than L1 (See Figure 1.1). These results replicate the findings of Gollan et al. (2008) and extend them to bilingual performance in L1 and L2, lending further support to the frequency lag hypothesis.

There was more priming for LF words than for HF words for English monolinguals, bilingual L1 and L2 (See Figure 2.1), thus replicating the results of Wheeldon and Monsell (1992), and extending them to include bilinguals. There was greater priming for bilingual L2 than L1, and more priming for bilingual L1 than for monolinguals (See Figure 2.1), as in Francis et al.
Although we did not find a priming interaction between frequency and language dominance in repetition priming in bilinguals, the frequency effect was stronger for bilinguals in both L1 and L2 than for monolinguals. Thus, some of the patterns of repetition priming also lend further support to the frequency lag hypothesis. The interaction of language and frequency for priming in bilinguals did not support the frequency-lag hypothesis.

The interaction of language and frequency for priming in bilinguals was not significant. This was an unanticipated new result that was not consistent with the frequency lag hypothesis. One reason for the absence of an interaction in priming may be because our sample was collected in a region where there are highly proficient bilinguals in English and Spanish. This means that the difference in proficiency between L1 and L2 may be smaller than what it would be with a less balanced bilingual sample. An alternative explanation for the absence of an interaction of language and frequency on priming is that the results may instead be explained by an interference account of language production. It may be that because a bilingual cannot turn a language “off” that having both languages “on” interfered with how bilinguals responded to picture names, because both languages are always “on” naming pictures in one language may have been interfered with by the other language.

An alternative explanation of these findings discusses the results using a competition account of language production. It may be that word frequency affects lexical access and selection of pictures names in the picture naming task and that there is more than one related concept competing for selection (Alario, Costa, & Caramazza, 2002). For example, if the participant sees a picture of a trombone, they may have the words “trombone” and “trumpet” competing for selection. This competition account predicts that competition for selection of words at production for bilinguals in L2 may have delayed production of their L1 (Gollan, et al., (2008).
This possible interpretation may be the reason why we found the response time interaction of language dominance by frequency, as well as the stronger frequency effects for bilinguals than monolinguals in priming.

The findings of the present study are significant because most of the work done to evaluate the frequency lag hypothesis came from a single study. A replication and extension was warranted. We replicated and extended the response time findings predicted by the frequency lag hypothesis. Specifically, we demonstrated for the first time an interaction of language and frequency on picture naming response times in bilinguals. Also, the findings of the present study are significant because the present study investigated an interaction of language and frequency that had not been extensively studied in previous research. We tested new predictions about the effects of language dominance and frequency on repetition priming. Although we did not find the predicted interaction of language dominance and frequency on priming within bilinguals, frequency effects were stronger for bilinguals than monolinguals, as predicted.
References


Vita

Renee Michelle Penalver earned her Bachelor’s degree in Psychology from California State University, Bakersfield in 2011. During her undergraduate work Ms. Penalver worked in a behavioral neuroscience laboratory for two years where she used rodent models to study short-term and long-term memory. In 2010 she was accepted into the Social Cognitive Neuroscience PhD program at the University of Texas at El Paso to work in the Bilingual Cognition Lab. She started her graduate studies in August 2011 under the direction of Dr. Wendy Francis. She received her Masters Degree in Psychology in 2014.

Renee has worked as an instructor of a one-unit Psychology course for three semesters and as a PhD research associate for five semesters. She is passionate about her field and plans to finish her PhD degree. After she receives her PhD, she plans to find a postdoctoral fellowship in the area of cognitive neuroscience to strengthen her current skills and to get a different perspective of her field and further contribute to science.

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