INTERMEDIATE BILINGUAL COMPREHENSION VIA TARGET LANGUAGE PRIMING WITH A SHORT PASSAGE OF DISCOURSE

by

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Abstract

The revised hierarchical model assumes a strong lexical link from L2 to L1 and a strong conceptual link from L1 to L2, with both links being contingent on L2 fluency. The bilingual memory literature has discussed the role of L2 fluency in bilingual lexical and semantic retrieval; however, little is known on how priming for a target language (L1 or L2) may affect lexical and semantic access or how it is affected by L2 proficiency. The present study utilized the revised hierarchical model to examine how language priming and intermediate levels of L2 fluency affects bilingual lexical and semantic retrieval in a yes/no image/word task.

181 participants read four paragraphs of discourse to prime for a specific target language (English or Spanish) and performed a modified picture-word interference task (MPWI), in which they had to determine if image/word pairs were congruent (matched) or incongruent (did not match). The main dependent variables were accuracy and RT on the MPWI task. Additional DVs were accuracy and RT on comprehension questions over the content of the priming discourse and question type (explicit, factual, and pragmatic).

Across intermediate levels of L2 fluency, those more fluent performed faster and were more accurate on the MPWI task than those less fluent. No differences were observed when the image/word pairs were congruent for English or Spanish, yet there was a language difference when incongruent for Spanish. Readers had highest percent correct for explicit questions and lowest for pragmatic questions, took longer on factual than pragmatic question, and took longer to respond when priming discourse and questions were in Spanish than when in English.

The results are interpreted and discussed in terms of the revised hierarchical model, in that fluency, at least at the intermediate level, affects processing time more than accuracy. Limitations of the study, future directions, and implications for L2 educators are also discussed.

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Chapter 1 - Introduction

Learning to use a second language is quickly becoming common in American society, although it has long been the norm for much of the world. Between 1980 and 2007, Spanish saw the greatest increase of languages other than English spoken at home within the U.S., from roughly 11 million people to approximately 34.5 million people (U.S. Census Bureau, 2010). This increase in language diversity exemplifies that being having skills in two languages is no longer the exception and rapidly becoming the rule. Interest in the development of an L2 and the mental processes that accompany this development of a second language have been studied extensively among researchers (Kirsner, Smith, Lockhart, & King, 1984; Kroll & Curley, 1988; Menenti, 2006).

Highly fluent bilinguals are able to switch between their two languages almost effortlessly with intrusions from the non-activated language being very uncommon. In doing so, they are able to actively search, identify, and retrieve from memory the correct lexical and semantic information for the appropriate language. Some researchers have suggested that each language has certain linguistic tags, or lemmas, which can help identify the correct language to select (Green, 1998). "How are the bilinguals' languages separated? (or are they separated?)" and "how is the information stored and represented for each language?" These are questions that have been the focus of numerous studies and have been extensively studied and scrutinized, with researchers creating various theories and models in hopes of adequately resolving the issue (Costa & Caramazza, 1999; Dijkstra & Van Heuven, 1998; Dufour & Kroll, 1995; Kroll & Stewart, 1994; Kirsner, Smith, Lockhart, & King, 1984; Potter, So, von Eckardt, & Feldman, 1984).

Language Mode Continuum

Previous research has suggested that a bilingual's two languages are on a continuum of activation (Grosjean, 2001). On the opposite ends of the continuum, there are two modes; the monolingual and the bilingual mode. In the monolingual mode, the bilingual lowers the activation level of the unused language, but does not completely deactivate it. In the bilingual language mode, the bilingual decides on a base language, i.e., the language they choose to engage in, but can maneuver back and forth between the languages. Typically the base language is the more active of the two (Grosjean, 2008).

There are numerous factors that can help the bilingual maneuver along the language mode continuum. Among these factors are whom the bilingual is speaking with or listening to, the situation the bilingual is in, whether monolinguals are also present, the level of formality (speaking with colleagues as opposed to speaking to friends or family), and the function of the utterance, e.g., to request something, describe something, to communicate, etc. (Grosjean, 2008).

Grosjean (1997a) suggested that it is possible to manipulate the position of a bilingual on the language mode continuum. In a "telephone chain" experiment, French–English bilinguals were told they had to convey information from a story (half consisting of typical French scenes in French and the other half consisting of American activities in French containing English code-switched words) to another person not actually present (a native French speaker who was able to write English but had difficulties speaking it (condition A), a person who had lived in the U.S. for seven years and only spoke French at home (condition B), or a person who had both American and French friends and spoke both languages at home (condition C)). Results indicated that the bilingual stories evoked more English in the form of language switching and borrowing than did the monolingual (French) condition. The number of language syllables and language

hesitations were a function of the person being addressed; in the monolingual condition, there were more French syllables and fewer English syllables. In condition C, there were more French than English syllables; yet, there were more English syllables in this condition than in the monolingual French condition. Grosjean suggested this indicates if a bilingual suspects the individual they are talking to is less proficient in one language, they are more likely to stay on the base language side of the continuum and not switch to the other language as much, whereas if they suspect the individual is proficient in both languages, language switching increases.

When one begins the process of acquiring a second language (L2), they must acquire the accompanying linguistic information of that language, i.e., lexical, semantic (conceptual), orthographic, and phonological information associated with this language, any of which may be very similar to their native language (L1) or something entirely new altogether. The bilingual also has to store this new information alongside an already established similar system (their L1). How exactly is this new linguistic information stored and more importantly, how do these two systems interact, if at all?

Bilingual Lexical Selection

Potter, So, Von Eckardt, and Feldman (1984) contrasted two models of interlanguage connection, specifically processing lexical and conceptual representation associations between L1 and L2. They argue there are two separate and distinct lexicons, one for each language and that there is also a shared, conceptual system connected to both languages. The word association hypothesis suggests the bilingual is constructing a direct lexical link from a word in L2 to its translation in L1. The alternative to the word association hypothesis suggests that there is no direct association between the L2 and L1 words, but instead the two words are connected only

through the nonlinguistic semantic representations associated with the two words. This hypothesis is called the concept mediation hypothesis. The word association hypothesis predicts that theoretically it should take longer when translating from L1 to L2 than translating from L2 to L1, as access to and from the L2 is directly through the L1 (e.g., *perro* would take longer to identify than *dog*, because it would have to be translated to *dog* first before it can be comprehended). In other words, according to this hypothesis, having to identifying an image by its L2 name requires extra steps, i.e., identify and retrieve the concept, retrieve the word from L1, and then translate that information from L1 to L2, resulting in an increase in reaction times. The concept mediation hypothesis suggests that it takes relatively the same amount of time to access and identify, as the only association between the L1 and the L2 is the nonlinguistic concept common to the word in each language (e.g., *perro* and *dog* share similar concepts).

To explore these hypotheses, Potter et al. (1984) conducted two experiments; one study with highly proficient Chinese–English bilinguals and another study with lower L2 proficiency English–French bilinguals. The two studies compared how long it took to name (read) written words aloud, translate words into the other language, and name pictures in one or the other language. In Experiment 1, 6 blocks of 16 items (96 items total) were presented in the same order to all participants. Item type (picture, Chinese word, English word) were counterbalanced across participants, with each participant seeing one block of each item type for the first half of experiment and a second block of each item type for the second half. There were two groups in Experiment 1; group 1 named and translated item types and group 2 matched items to superordinate categories. For the blocks in group 1, response language for one block of each item type was Chinese and for the other block, English was the response language. In group 2, the participants responded with yes or no or the Chinese equivalent, with half the items in the blocks

matching the category. Additionally, the language of the category name and response was in English for half the blocks and the other half was in Chinese. The results from Experiment 1 indicated that picture naming in L1 was slower than word naming, and more importantly, picture naming in L2 was slightly faster than L1 words being translated into L2. Despite not obtaining significance, Potter et al. argued that this result supports the concept mediation hypothesis and that category matching a concept (identifying that the image of a chair was in the category of "furniture") for an object is retrieved as rapidly as from a picture as from a word written in L1. They further argued that the results from the study indicated that for highly proficient bilinguals, there was no evidence of a direct lexical link or association between L2 and L1 words, and as such, did not support the word association hypothesis.

To see if these obtained results for highly proficient bilinguals was comparable for those of lower fluency, Potter et al. replicated Experiment 1 with bilinguals of lower proficiency. In Experiment 2, with a similar design and procedure, Potter et al. found comparable results; unbalanced English-French bilinguals named pictures in L2 (French) faster than translating an L1 (English) word into L2 and that word identification in L1 was faster than picture naming in L1. Additionally, the participants made significantly more errors in naming and translating into L2 (French) than in comparison to the errors from Experiment 1 (.35% to .07%, respectively). Yet, both bilingual groups required more time to respond to a picture with the L2 word in comparison to an L1 word. Considering these results from otherwise comparable studies with both balanced and unbalanced bilinguals, Potter et al. argued that these results are evidence for the concept mediation hypothesis over the word association hypothesis. If both languages are activated in parallel and there were a direct association between L1 and L2, then a word written in L1 should theoretically be a better indicator or stimulus than the picture of the word, yet this

was not particularly the case. They went on to further argue that a bilingual's two languages come together on similar conceptual grounds (a shared storage system for conceptual information) and that the results obtained in the study were not the result of direct association or link between lexical items.

Prior literature has examined how a nonnative language develops alongside an already established system. Using a semantic (category) facilitation and translation priming paradigm, these studies observed similar results; translations from L2 to L1 were typically faster than translating from L1 to L2 (Kroll & Stewart, 1994; Potter et. al, 1984). Chen and Ng (1989) and Chen and Leung (1989) further explored Potter et al.'s hypotheses. What makes these studies interesting is that they found similar results of semantic facilitation and translation priming effects with orthographically more different languages (Chinese–English bilinguals).

Following Potter et al. (1984) and their conclusions, and based off results from a previous study examining conceptual access in bilinguals (Kroll & Curley, 1988), Kroll and Stewart (1994) challenged these results and developed a model for bilingual categorical and lexical mental representations. Kroll and Curley (1988) had separate groups of bilinguals name words, translate words, or identify pictures in L1 or L2 under different conditions. In one, the words within the lists were semantically related (clothing items: *coat, mitten, jacket, shirt, pants, shoes*) and in the other, the lists contained mixed examples from semantic categories (random items: *apple, coat, desk, horse, cherry, skates*). Kroll and Curley found somewhat counterintuitive results, in that for the semantically categorized lists, it took longer for fluent bilinguals to translate into L2 than when the lists were randomized. Overall, it took bilinguals longer to name pictures in L1 when categorized than when mixed.

In hopes of replicating the category interference effect observed in Kroll and Curley (1988), Kroll and Stewart (1994) explored category interference when translating and picture naming across three experiments. The evidence indicated that this category interference effect was the result of having to access the conceptual representation for the image and the word first and then activating and selecting the appropriate lexical-level information. Experiment 1 replicated the categorization interference effect in picture naming and in Experiment 2, Kroll and Stewart showed this effect could be removed when having to alternate picture naming and word naming from trial to trial. Utilizing Dutch–English bilinguals in the Experiment 3, Kroll and Stewart observed similar results for bilinguals as they had for monolinguals in Experiments 1 and 2; translation and picture identification from L2 to L1 was faster than translating from L1 to L2. The theoretical relevant results suggested that bilinguals experienced the same type of interference as the monolinguals from Experiment 1 and 2 for concept-based translations from L1 to L2; however, this did not occur when translating from L2 to L1. Reaction times for translations from L2 to L1 were similar for both categorical and randomized conditions.

From these results, Kroll and Stewart (1994) developed the revised hierarchical model. The model is hierarchical in structure, in which representations at the lexical level are independent for each language; however, representations for concepts are linked between the two languages. The model assumes that early in the development of an L2, there is a heavy reliance on the L1 for translation between the two languages, with the L2 language only being accessible via the lexical level of the L1. As they are acquiring a lexical link between L2 and L1 before being able to conceptually mediate information in L2, bilinguals should be faster at translating and picture identification from L2 to L1 and take longer to picture name and translate from L1 to L2. Additionally, the model assumes that interlanguage connections between the lexicon of the

L1 and the lexicon of the L2 are different in size and strength, with the L1 lexicon typically being the larger of the two. The model is thus asymmetrical in nature for L1 and L2.

Numerous studies have shown that there is a developmental shift occurring between the two languages after a certain point (Francis, Tokowicz, & Kroll, 2014). For example, utilizing a similar design to Kroll and Stewart (1994), Talamas, Kroll, and Dufour (1999) provided results that were consistent with the revised hierarchical model, specifically at the lexical level; less proficient bilinguals (English–Spanish) relied more heavily on the lexical level for access and retrieval, whereas more proficient (balanced) bilinguals focused more on semantics and the conceptual level in a translation recognition task.

Picture–Word Interference Task

A frequently used task to study language selection and inhibitory/facilitative processes in language selection is the picture-word interference task. The picture-word interference task (PWI) has been used in various studies in the literature on language control and inhibition and bilingual word production (Jared & Kroll, 2001; Costa & Santesteban, 2004; Costa & Caramazza, 1999; Costa, Miozzo, & Caramazza, 1999; Meuter & Allport, 1999; Kroll, Bobb, Misra, & Guo, 2008; Kroll & Sunderman, 2008). The PWI task shows an image/word pair, in which the relationship between the image and the word is systematically controlled. The objective of the task is to respond to the picture by naming it out loud and ignoring the accompanying word.

Rosinski, Golinkoff, and Kukish (1975) and shortly after Rosinski (1977) examined lexical and semantic information processing in children utilizing the PWI task. When the distractor word was paired with an image that is semantically related, it generally took

participants longer to respond than if the image was paired with a non-semantically related word, e.g., the image of a dog paired with the word "chair." The semantic information of the word is activated along with that of the image and a semantically related distractor word increases response latencies in comparison to other conditions (CVC trigrams, words congruent with image). The same findings described above have also been observed in bilingual studies of word production. The language of the stimulus can affect participant's response rate. Moreover, the language the participant is required to respond in can also affect response latencies. Therefore, the word can either have a facilitative or interfering effect on picture naming, depending on the relationship between the word and the picture (De Groot, 2011).

Remaining Questions

Intermediate Fluency

The large majority of previous research on second-language usage has tested highly proficient bilinguals. However, there have only been a handful of studies examining those in the process of acquiring their L2 (Chen & Leung, 1989; Costa & Caramazza, 1999; Kroll & Stewart, 1994; Potter, So, Von Eckardt, & Feldman, 1984). With English– French bilinguals still in the developing stages of their L2, Potter et al. (1984) showed that even those of lower fluency still utilized the concept mediation path and not the word association path, i.e., translation from L2 to L1. However, the results of Potter et al. should be seen in light of the bilinguals' circumstances, i.e., English–French bilinguals who had been preparing for a study abroad trip to France. Perhaps these English–French bilinguals, who were highly motivated to learn the L2, had passed the stage of direct lexical link between the L1 and the L2, and were already able to conceptually mediate between the two languages. As researchers have suggested that this lexical selection

mechanism/ability may not yet be fully developed in early stages of L2 development, it surely merits further research. To better understand how the developing bilinguals' languages are interconnected and perhaps when they are experiencing this developmental shift between their languages, the present study examines a range of limited L2 fluency, specifically, it examined three levels of intermediate L2 proficiency. The three levels of intermediate fluency in the study were equivalent to approximately a range of a year and a half of L2 language exposure and instruction.

One question that still remains unresolved in the literature is how does L2 fluency affect the ability to identify and select the appropriate lexical entry when both semantic (information relating to the image) and lexical information (the lexical information of a word or image) are activated and searched at the same time? If fluency plays a role in how bilinguals are able to switch between their two languages, bilinguals who are less fluent in their L2 should rely more heavily on the lexical link from L2 to L1. Moreover, those of higher proficiency will not have to do this translating in the task, but rather can directly access the meaning of the L2 word in the L2 conceptual network (Potter et al., 1984).

Costa and Caramazza (1999) briefly mention and discuss the effect of proficiency in lexical selection, stating " …it is not clear at which stage in second-language acquisition [the lexical selection mechanism] becomes functional…it may be that at early stages of L2 acquisition, this mechanism is not yet functional" (p 240). Other researchers have also discussed the contention of a fluency effect as well. Meuter & Allport (1999) briefly addressed the effects of fluency in their study; those who had little difference in fluency (more fluent) between their languages performed faster in both switch and non-switch trials in comparison to those who had a greater proficiency difference between the two languages (less fluent L2). Despite previous

research suggesting fluency's effect on interlanguage connections between L1 and L2, exactly when this developmental shift occurs between the two languages still remains unclear.

Language Priming

Prior research has examined priming and its effects on language production in both monolinguals and bilinguals. More specifically, previous research has examined semantic priming and how it affects L1 to L2 word translations and picture naming and vice versa from L2 to L1 (Kroll & Stewart, 1994), in hopes of developing a better understanding of how bilingual memory is represented. However, no research has examined language priming and switching and its effects on L1 and L2 interlanguage connection and processing in a yes/no image/word pair task. The priming discourse would provide a more extensive amount of prior exposure to one of the languages, and theoretically, might move one along Grosjean's language mode continuum.

A large proportion of studies that have examined bilingual word comprehension research have utilized designs that focus on either single word production or discrimination between letter strings (Christoffels, Firk, & Schiller, 2007; Costa & Santesteban, 2004; Meuter & Allport, 1999; Phillip & Koch, 2009). However, the current study examined the possible language priming effects of connected discourse on comprehension, specifically how to manipulate a bilingual's location on Grosjean's (2001) language mode continuum and how linguistic manipulation can affect a bilingual's ability to switch from one language to another on a subsequent task. The usage of connected discourse is to create a stronger prime for a specific language, whether L1 or L2.

The overall aim of the present study was to examine the performance of intermediate L2 language learners on a semantic-lexical yes/no task. The picture-word interference task was adapted and implemented as the modified picture word interference task (MPWI), a type of yes/no task. As previously mentioned, the picture-word interference task is a word-production task in which an image is accompanied by a word, and the objective of the task is to verbally respond to the picture by naming it, while ignoring the accompanying word. The task was modified from a production task to a comprehension task; in the MPWI, a trial consisted of an image/word pair being presented with the task requiring the participant to decide via pressing a key whether an image and a word were congruent (match) or incongruent (do not match).

Chapter 2 - Method

Participants

Participants were recruited from General Psychology and Modern Languages classes of Spanish 2 and above. Students from General Psychology received course credit as outlined in their course syllabus and students from Modern Languages received extra credit in their Spanish course for participating. To be eligible to participate in the study, participants must have either: completed at least 2 semesters of Spanish in college or be currently enrolled in Spanish 2 or above, 2 years or more of Spanish in high school, or come from a bilingual background, (i.e., possessing a relatively high fluency in both the languages of interest in the study). The mean age of the participants in the study was 19.63 (SD = 2.55) and ranged from 18 to 44 years of age. 34.8% of participants were male and 64.6% were female.

The initial sample consisted of 186 participants who varied in levels of intermediate fluency in Spanish. Of the initial 186, 5 participants were removed from the study for corrupted

data files. Of the 181 participants remaining, 60 were identified as high school Spanish or collegiate-level Spanish 2. Of that 60, 20 participants who indicated that the last Spanish course they had taken was Spanish in high school and were currently not enrolled in any Spanish courses. They were originally not included in the Spanish 2 group and consisted of a group on their own. However, after examining accuracy on the task for each condition, the scores for those from high school Spanish were comparable to those who were currently in Spanish 2 (Table 1). Therefore, they were included in the Spanish 2 group. 55 participants were in Spanish 3, and 66 were identified as Spanish 4 or above, which included Spanish courses past Spanish 4, e.g., Spanish Conversation, or those students who identified as being from a bilingual household (and technically, had acquired their L1 and their L2 simultaneously). The means for these higher fluency bilinguals were comparable to those students who were currently enrolled in Spanish 4 and to those who were enrolled in courses above Spanish 4 (e.g., Spanish Conversation) (Table 2).

Table 1. **Mean accuracy of high school Spanish participants compared to Collegiate Spanish 2 participants on MPWI task**

Foreign Language Fluency	English discourse – English MPWI	English discourse – Spanish MPWI	Spanish discourse – English MPWI	Spanish discourse – Spanish MPWI
High School Spanish	97%	78%	96%	77%
Collegiate Spanish 2	98%	82%	98%	80%

Table 2. **Mean accuracy of Collegiate Spanish 4 compared to higher fluency bilingual participants on MPWI task**

Foreign Language Fluency	English discourse – English MPWI	English discourse – Spanish MPWI	Spanish discourse – English MPWI	Spanish discourse – Spanish MPWI
Bilingual Participants & Above Spanish 4	97%	83%	98%	84%
Collegiate Spanish 4	96%	91%	98%	88%

Materials & Design

Prior to the experiment, participants filled out a short demographic questionnaire and a questionnaire on their perceived spoken and written fluency in Spanish and English (adapted from Rai et. al., 2011 and found in Appendix B). They completed the questionnaires before the experiment and not afterwards, as having to fill out the self-rated fluency post experiment may have an effect on their self-ratings.

Priming Material

The priming stimuli for the study consisted of four short passages of discourse, which ranged from 136 words to 157 words for English and 141 to 157 for Spanish. These short passages of discourse intended to prime a specific language (Spanish or English). The priming short passages of discourse used were written in English and then translated into Spanish by a highly proficient Spanish–English bilingual and then back translated into English by a different Spanish–English for cross-lingual validity. Any discrepancies between the translations were discussed and resolved between the latter translator and the researcher.

The priming discourse was intended to shift the participants to the appropriate monolingual mode on the bilingual continuum, as suggested by Grosjean's (2001; 2008) bilingual mode model. In other words, if the priming discourse were presented in Spanish, it should put the participant in the Spanish monolingual mode and conversely for English. The priming discourse was presented one sentence at a time on the computer screen and the participant was able to actively control how fast they wanted to read through the paragraph, i.e., there were no time restrictions or limitations on how fast they had to read through the priming discourse.

The priming discourse and the comprehension questions for each language can be found in Appendix C. An example of an English priming passage of discourse and the comprehension questions can be found below.

> "John was driving on I-70 to Kansas City for the job interview of a lifetime. He had recently applied for a research position at a new company and had received a call that they were interested in interviewing him for the position. John made sure that he had left early just to ensure that he would make it to Kansas City on time. John was typically someone who would wait to the last minute to do something. Yet he wasn't going to wait until the last minute to leave his house and wanted to be prompt and ready for the interview. Halfway there, John heard a loud "POP!" and instantly began to swerve. John regained control of his truck and pulled over to the side of the road and knew his worst fear had come true."

1) Where was John's interview? (**Explicit Question**)

A) Kansas City C) Dodge City

B) Topeka D) Lawrence

2) What job position did John apply for? (**Factual Question**)

A) Manager C) Truck Driver

B) Research team D) Librarian

3) What did the loud "POP" suggest to John? (**Pragmatic Question**)

A) Something wrong with engine **B) He had a flat tire**

C) Hit an animal D) Something fell off his truck

Following each priming discourse passage were three comprehensions questions on information from the discourse in the same language as the passage. The first question asked about explicit information about a number or proper name/noun in the story and was directly stated in the paragraph, i.e., information that one would not need to thoroughly read the paragraph to obtain (e.g., "Where was John's interview?"). The second question asked factual information, i.e., certain information that one would learn from reading through the paragraph (e.g., "What job position did John apply for?). Finally, the third question asked the participants to make a pragmatic inference, i.e., infer beyond the information provided in the paragraph (e.g., "What did the loud "POP" suggest to John?"). The presentation order remained constant as described above, starting with the easiest (explicit) question first, then increased in difficulty, with the pragmatic inference question being the last question answered. Each question was presented as a 4-choice multiple-choice question and the length of the questions and answers for each type across the two languages were as follows: English: explicit, M = 14 words; factual, M

= 15.25 words; pragmatic, M = 20.75 words; Spanish: explicit, M = 12 words; factual, M = 19.25 words; pragmatic, M = 23.25 words.

The three classes of comprehension questions used in the study were based on Kintsch's (1998) model of text comprehension. In the model, Kintsch argues that text is represented on three distinct levels; the surface form, textbase, and the situational model level. The surface form is the most shallow of the three levels and contains the exact words from the text, the surface level information. The textbase represents the semantic relationship of the words and takes into account the local context of the words in the sentence. Stated otherwise, the textbase is similar to the idea of a paraphrase of the original text, most likely in the form of propositions. The situational model level is comprised of both the readers' prior knowledge and of the textbase. The situation model also includes information that is not part of the original text, e.g., inferences, and is the most durable of the three levels.

Modified Picture–Word Interference Task (MPWI)

The principal experimental portion consisted of 4 conditions with 16 MWPI trials per condition (list of conditions can be found below pg. 19). For each condition, the participant saw 16 images; 8 presented with congruent words in which the word and the image were congruent with one another (e.g., a picture of a house paired with the word "HOUSE") and 8 with incongruent words (e.g., a picture of a house paired with the word "UMBRELLA"). Example items for a congruent image/word pair and an incongruent image/word pair for the MPWI task for each language can be found in Appendix D.

The order of the congruent and incongruent image/word pairs for the MPWI varied, in that the image/word pairs were presented in a random order for each participant. Similarly to the

priming discourse, the words used were translated into Spanish by a highly proficient Spanish–English bilingual and then back translated into English by a different Spanish–English for cross-lingual validity. The researcher and the latter translator agreed with 95% accuracy on translations, with any discrepancies between the translations being discussed and resolved between the latter translator and the researcher.

The images and words used for the present study were taken from Rossion and Pourtois (2004). Rossion and Pourtois were interested in what information was provided by colorized objects and if colorized objects aided in object recognition. Rossion and Pourtois took the original Snodgrass and Vanderwart (1980) images and created color replicas. The complete list of stimuli originally used by Snodgrass and Vanderwart consisted of 260 schematic colorless images. Rossion and Pourtois applied color and shading to all the images and the results suggested that providing color information facilitated basic object recognition. For the present study, of the 260 images, every 4th image was selected as a stimulus for the current experiment, and thus having 65 images together. The last image on the list was dropped to allow for equal number of trials for the conditions described below. Additionally, the letter length of words used were comparable for both languages (M= 5.4 letters per word for English; M = 6.4 letters per word for Spanish), with only an average of a letter difference between the two languages. A full list of the words for each language can be found in Appendix E.

Reaction times (RT) for the MPWI task were recorded by *E-prime* in milliseconds from the onset of the image and the word until the participant responded. All participants received each of the following conditions in counterbalanced order:

All English Condition **(English priming discourse and English words)**

English priming discourse + questions, MPWI with a mixture of congruent picture/word pairs and incongruent picture/word pairs entirely in English

All Spanish Condition **(Spanish priming discourse and Spanish words)**

Spanish priming discourse + questions, MPWI with a mixture of congruent picture/word pairs and incongruent picture/word pairs entirely in Spanish

English/Spanish Condition **(English priming discourse and Spanish words)**

English priming discourse + questions, MPWI with a mixture of congruent picture/word pairs and incongruent picture/word pairs entirely in Spanish

Spanish/English Condition **(Spanish priming discourse and English words)**

Spanish priming discourse + questions, MPWI with a mixture of congruent picture/word pairs and incongruent picture/word pairs entirely in English

Procedure

The participants were comfortably seated in front of a computer screen and were told prior to the onset of the experiment they would participate in a practice trial. The practice trial consisted of one short paragraph of meaningful discourse in English followed by the three comprehension questions over the discourse. The priming discourse was presented one sentence at a time, with the participant being able to control how fast they wanted to read through the paragraph, i.e., there were no time restrictions or limitations on how fast they had to read through the priming discourse. Following the comprehension questions, 10 trials of the MPWI task in English were presented, with 5 congruent and 5 incongruent trials. The MPWI image/word pairs in the practice trial remained constant throughout the entire experiment and were not repeated in

the experimental portion of the study. At the end of the practice trial, participants were told that the experimental portion of the study "was very similar to the practice portion." For all participants, the oral instructions were given in English.

After the participants read through the priming discourse, they responded to three comprehension questions about the story (an explicit question, a factual question, and a pragmatic inference question). The order of the comprehension questions was constant throughout the experiment, with the easiest (explicit) question first and the most difficult (pragmatic inference) question being the last before the MPWI task. Each question was presented as a 4-choice multiple-choice question.

After finishing reading the priming discourse and having answered the comprehension questions, participants then proceeded to the MPWI. In this section of the study, the participants were instructed to stare at a fixation cross that lasted for 5000 milliseconds (5 seconds) after the priming discourse and before the onset of the first MPWI stimulus. After the 5 second period was over, the fixation cross was removed and the first MPWI trial began. Participants were instructed to respond as fast and as accurately as possible. They were told that the main question of the task was to determine "does the image match the word?" by making either a "yes" or "no" keyed response. A "yes" response was indicated by the z key and was labeled "yes" and the "no" response was the backslash key and labeled "no". For example, if the presented image was a table, and the presented word was "CAT" or "GATO" (depending on the language condition) the correct response would be "no," indicating that they do not match. Additionally, in the experiment, there was only the presence of one false cognate, the word "*PAN*" (Spanish for *bread*). Although the presence of this one false cognate, its English image counterpart (an image of a frying pan) was not used in the study.

The priming stories of discourse were counterbalanced with a partial Latin square design. Likewise, the ordering of the conditions described above were also counterbalanced with a partial Latin square design. Therefore, each participant saw two of the possible four priming stories in English and two of the possible four priming stories in Spanish. The four stories acting as the priming discourse appeared the same approximate number of times in English and Spanish over the entire experiment. At the end of the study, the participants were debriefed.

Research Questions

Given prior research, the following research questions were examined:

RQ1: Considering Grosjean's language mode, is it possible to prime a certain language in such a way as to facilitate switching to the primed language faster on a subsequent and different task?

RQ2: What are the effects of the levels of L2 fluency on the ability to switch between a primed language of discourse and the language of a subsequent task?

Considering these research questions, the following specific hypotheses were proposed:

Hypotheses

Modified Picture–Word Interference

H1: Based on Grosjean's language mode model, participants will respond faster on the MPWI task when the language of the priming discourse is congruent with the language of the MPWI task, regardless of that language. Participants will have shorter reaction times, as the priming

discourse has primed them in the correct language required for the task. Having been primed for a specific language, participants will take longer on the task when having to switch languages.

H2: As the lexical and semantic information is activated concurrently in the MPWI task for, when the task is in the L2, those who are less fluent will (a) take longer to respond to the MPWI task and (b) be less accurate in their responses, than those who are more fluent. The more fluent are better able to retrieve and access both the conceptual and lexical information of the image/word pairs and will respond faster than those who are less fluent, as predicted by the revised hierarchical model (Kroll & Stewart, 1994; Potter et al., 1984).

H3: Further considering fluency in terms of the revised hierarchical model, when the lexical item in the task is in the L2, those who are more fluent in their L2 will discriminate the image/word pair match faster than those who are less fluent. Participants must access and retrieve the lexical and conceptual information and determine the relationship between the image/word pair. Those of lower fluency will take longer as they rely more heavily on the lexical link between their L2 and L1, whereas those who are more fluent no longer rely on this lexical link and are able to retrieve the conceptual information for that image (Kroll & Stewart, 1994; Potter et al., 1984)

H4: Participants will **(a)** be more accurate when the MPWI task is in English than when the task is in Spanish, and **(b)** respond faster when the MPWI task is in English than when the task is in Spanish, as English is their stronger language.

Priming Discourse Comprehension Questions

H5: Participants who are more fluent in Spanish will **(a)** respond faster on the priming discourse comprehension questions in Spanish than those who are less fluent in their L2 and **(b)** have higher accuracy scores on the priming discourse comprehension questions in Spanish than those participants who are less fluent in their L2.

H6: The pragmatic inference question will **(a)** have the longest response times, in comparison to the factual and explicit question, regardless of the language of the priming discourse and **(b)** have the lowest accuracy, in comparison to the factual and explicit question. As the pragmatic question requires the participant to draw an inference, i.e., go beyond the information present, it will require more cognitive effort and take longer to respond to than the explicit or factual question, whose answers are directly stated in the discourse (Kintsch, 1998).

H7: There will be an interaction between L2 proficiency (as measured by foreign language class) and the type of comprehension question, in that the difference in reaction time among the three comprehension question types will decrease as fluency increases. As participants become more proficient in their L2, the participants' mental representation of that language will become more easily accessible and allows them to extract information more quickly than those whose L2 is not as developed (Kintsch, 1998).

H8: Participants will **(a)** be more accurate when the priming discourse questions are in English than when the priming discourse questions are in Spanish and **(b)** respond faster when the

priming discourse questions are in English than when the priming discourse questions are in Spanish.

Chapter 3 - Results

The results are discussed in three separate sections. The first section addresses participants' accuracy and reaction time to the MPWI task. The language of the MPWI task and whether the language of the priming discourse and the MPWI task are congruent (switch or no switch) were within-subjects variables. Foreign language proficiency, as indicated by foreign language class (Spanish 2, Spanish 3, or Spanish 4) is between-subjects variable.

The second section examines the congruent and incongruent trials in the MPWI task. As a reminder, a congruent trial is when the image and the word match or are congruent (image of house| *house*) and an incongruent trial is when the image and the word do not match (image of house| *dog* or *perro*). Each language was crossed with type of trial, e.g., "English congruent," "Spanish non-congruent," etc. Foreign language proficiency is a between-subjects variable and the other variables were within-subjects variables.

The third section addresses participants' accuracy and reaction time to the comprehension questions following each priming discourse story. Question type and language were within-subjects variables and foreign language proficiency (foreign language class) was a between-subjects variable.

Modified Picture–Word Interference Task

Accuracy on MPWI

A 3-way mixed ANOVA of language congruency (priming discourse language and the language of the MPWI, switch or no switch), the language of the MPWI (English or Spanish), and foreign language fluency (Spanish 2, 3, or 4) was conducted on accuracy on the MPWI. See Table 3 for the proportion correct on the MPWI task for each condition by foreign language class.

Table 3. **Proportion correct on task for each condition by foreign language class**

Foreign Language Class	English discourse – English MPWI	English discourse – Spanish MPWI	Spanish discourse – English MPWI	Spanish discourse – Spanish MPWI	**Mean:**
Spanish 2	98%	80%	97%	78%	**88.25%**
Spanish 3	98%	82%	97%	81%	**89.5%**
Spanish 4	97%	84%	98%	85%	**91%**
Mean:	**98%**	**82.5%**	**98%**	**85%**	

There was no main effect for language congruency, $F(1, 178) = .95$, $p = .33$, $\eta_p^2 = .005$. This suggests that, regardless of whether the language of the priming discourse was congruent with the MPWI task, there was no difference in performance in accuracy on the task, suggesting no priming effects on accuracy. There was no significant interaction between language congruency and foreign language class $F(2, 178), = 1.32$, $p = .27$, $\eta_p^2 = .005$.

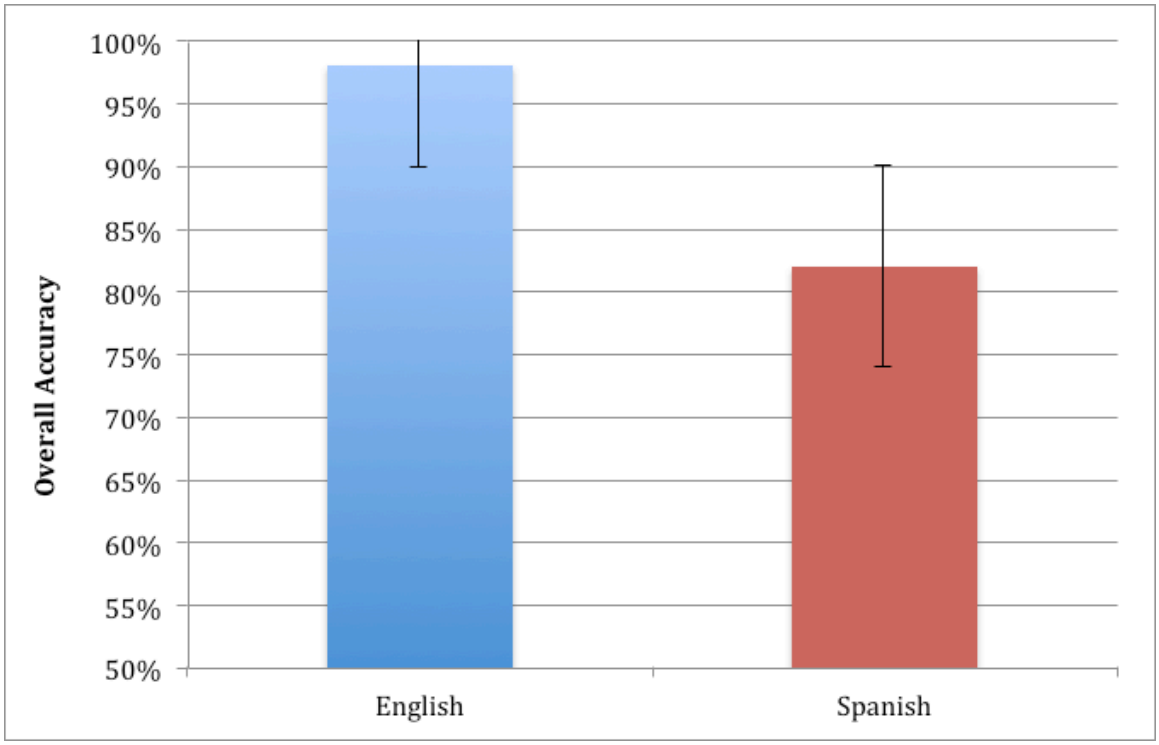

***Figure 1*. Language of MPWI task main effect**

However, there was a large and significant main effect for the language of the task $F(1, 178) = 563.76$, $p = .000$, $\eta_p^2 = .76$, such that participants had a higher proportion correct when the words of the MWPI task were in English than when they were in Spanish (Figure 1). As such, this result provides support for H4a.

In addition to this main effect, there was a significant interaction between the language of the task and foreign language class, $F(2, 178) = 6.26$, $p = .002$, $\eta_p^2 = .07$. When comparing performance in Spanish MWPI task language across foreign language class, those participants who were more fluent in their L2 performed better and had a higher accuracy on the task, $F(2, 178) = 5.9$, $p = .003$. Bonferroni post hoc comparisons revealed that on Spanish trials, low fluency bilinguals (Spanish 2) were similar to medium fluency bilinguals (Spanish 3) but were significantly less accurate than high fluency bilinguals (Spanish 4). For English, the

participants' accuracy remained high, regardless of their foreign language fluency (see Figure 2). This result provides support for H2b.

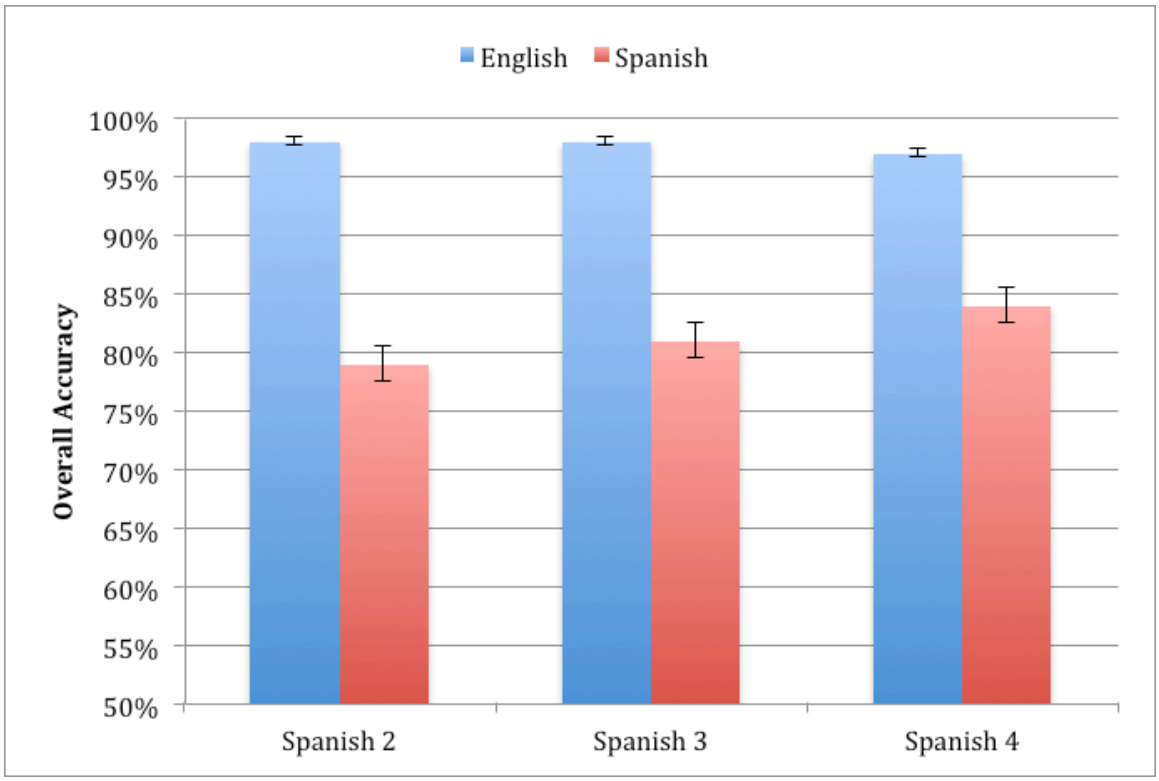

Figure 2. **Language of task by foreign language class interaction**

Finally, there was no significant interaction between language congruency and language of the MPWI task, $F(1, 178) = .64$, $p = .42$, $\eta_p^2 = .004$, nor was there a significant 3-way interaction between language congruency, language of the task, and foreign language class, $F(1, 178) = .61$, $p = .55$, $\eta_p^2 = .007$.

Reaction Time on MPWI

Prior to the analysis, the data were cleaned; all incorrect responses were removed from the data and the data were transformed using a logrt transformation, a standard procedure for

analyzing reaction time data. After the data were transformed, a 2% trim was utilized, as it is a common trim for reaction time data (Baayen & Milin, 2010); 1% was trimmed from the bottom and 1% from the top.

A 3-way mixed ANOVA of language of priming discourse (English or Spanish), the language of the MPWI task (English or Spanish), and foreign language fluency (Spanish 2, 3, or 4) was conducted on reaction time to the MPWI task. See Table 4 for mean reaction times for each MPWI condition by foreign language class.

Table 4. **Mean reaction time on MPWI task for each condition by foreign language class**

Foreign Language Class	English discourse – English MPWI	English discourse – Spanish MPWI	Spanish discourse – English MPWI	Spanish discourse – Spanish MPWI	**Mean:**
Spanish 2	941.90 ms	1654.36 ms	968.84 ms	1592.38 ms	**1289.37 ms**
Spanish 3	960.11 ms	1517.42 ms	1010 ms	1571.42 ms	**1264.86 ms**
Spanish 4	902.93 ms	1468.13 ms	929.13 ms	1408.38 ms	**1177.14 ms**
Mean:	**933.45 ms**	**1548 ms**	**967 ms**	**1521.41 ms**	

There was a large main effect for language of the task, $F(1, 178) = 604.98$, $p = .000$, $\eta_p^2 = .77$; participants were significantly faster at responding when the MWPI words were in English (952.24 milliseconds) than when they were in Spanish (1535.35 milliseconds) (Figure 3). As participants responded to the MPWI task faster in English than Spanish, this result provides support for H4b.

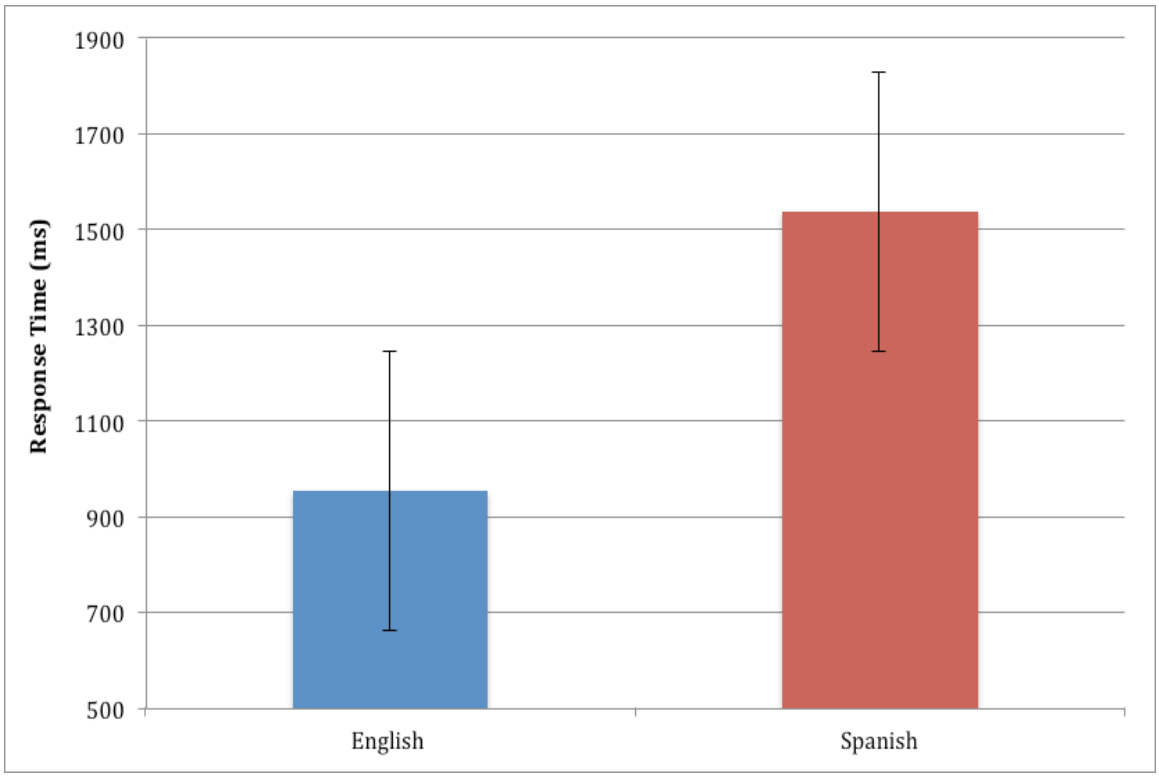

Figure 3. **Main effect for language of MPWI Task**

There was a significant interaction between the language of the task and foreign language class, $F(1, 178) = 3.61$, $p = .03$, $\eta_p^2 = .04$ (Figure 4). Further analysis revealed a significant difference between the three levels of intermediate L2 fluency, $F(2, 178) = 4.04$, $p = .02$, $\eta_p^2 = .04$, such that when the MPWI task was in English, participants were quite fast, regardless of level of intermediate fluency. However, when the task was in Spanish, there was a significant difference between the three levels of intermediate fluency, such that those of higher fluency (Spanish 4) responded significantly faster than those of lower fluency (Spanish 2 and Spanish 3) These results provide support for H2a.

Additionally, there was a marginally significant interaction between the language of the priming discourse and the language of the task, $F(1, 178) = 3.91$, $p = .050$, $\eta_p^2 = .02$ (Figure 5). Further analysis revealed that participants took significant longer when the language of the

MPWI task was in Spanish than when in English, regardless of what language primed with, $F(1, 180) = 8.5$, $p = .004$. More specifically, although participants were slower to respond to the MPWI when in Spanish than when in Spanish, when the language of the priming discourse was congruent, they were slightly faster than when the language of the priming discourse did not match the language of the task. These results provide partial support for H1.

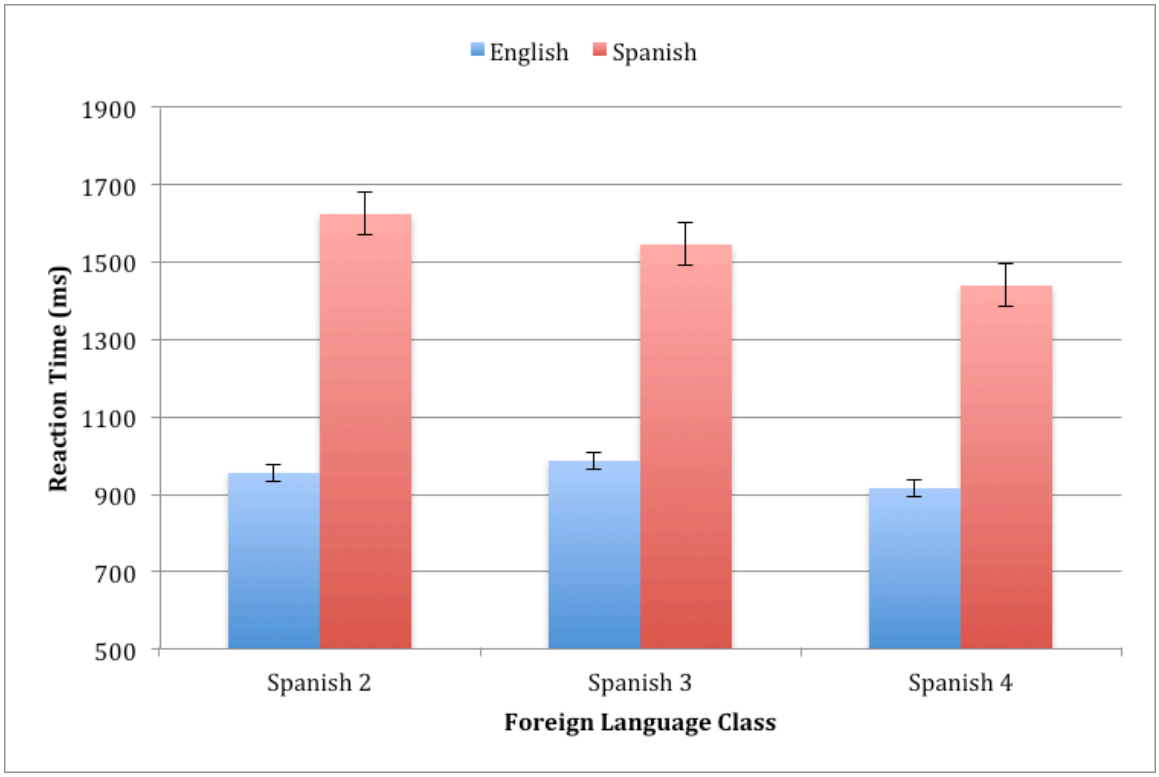

Figure 4. **Interaction between language of task & Foreign Language Class**

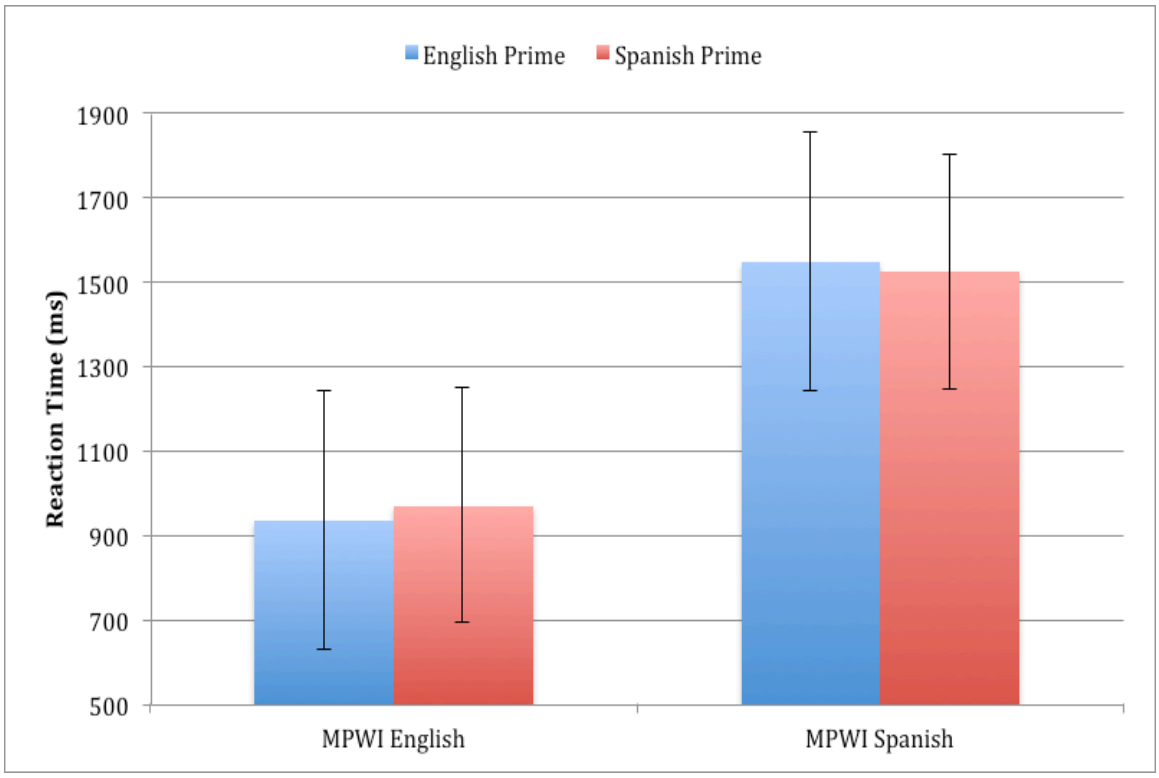

Figure 5. **Interaction between language of priming discourse and language of task**

The interaction between language of priming discourse and foreign language class was not significant, $F(1, 178) = 1.87$, $p = .16$, $\eta_p^2 = .02$. Finally, the 3-way interaction between language of the priming discourse, language of the task, and foreign language class was not significant, $F(2, 178) = 1.03$, $p = .36$ $\eta_p^2 = .01$.

MPWI Image/Word Pair Congruency

Composite variables for each image/word condition for each language were created by averaging the mean across all 32 trials for each language, e.g., "English congruent trials," "Spanish non-congruent trials," etc. The dependent variable in the image/word pair congruency analysis was reaction time to determine if an image/word pair was congruent or incongruent.

First, a one-way ANOVA of image/word congruency (2 levels: congruent and incongruent), not taking into account language, was conducted on reaction time and revealed no significant difference for image/word congruence, $F(2, 178) = 2.42$, $p = .09$, however there was a significant difference for image/word incongruence, $F(2, 178) = 3.39$, $p = .04$. Post hoc comparisons revealed that those in Spanish 4 were quicker at responding and discriminating than those in Spanish 2, yet there was no difference in response time between Spanish 2 and Spanish 3, nor Spanish 3 and Spanish 4.

To further explore this difference, an additional one-way ANOVA was conducted on reaction time for image and word congruency on the MWPI task when the task was in Spanish. Analysis revealed that there was no statistically significant difference of image/word congruence, $F(2, 178) = 1.98$, $p = .14$. However there was a significant difference of image/word incongruence, $F(2, 178) = 3.65$, $p = .02$. Post hoc comparisons indicated that Spanish 2 and Spanish 4 were significantly different from one another; students in Spanish 4 performed considerably faster than those in Spanish 2 when the image/word pair was incongruent (did not match). There was no difference between Spanish 2 and Spanish 3, nor was there a difference between Spanish 3 and Spanish 4.

Finally, A one-way ANOVA was conducted on reaction time for image and word congruency on the MWPI task when the task was in English. Analysis revealed no significant difference in response time for image/word congruent, $F(2, 178) = 2.53$, $p = .08$ or image/word incongruent, $F(2, 178) = 1.89$, $p = .15$. These results provide support for H3.

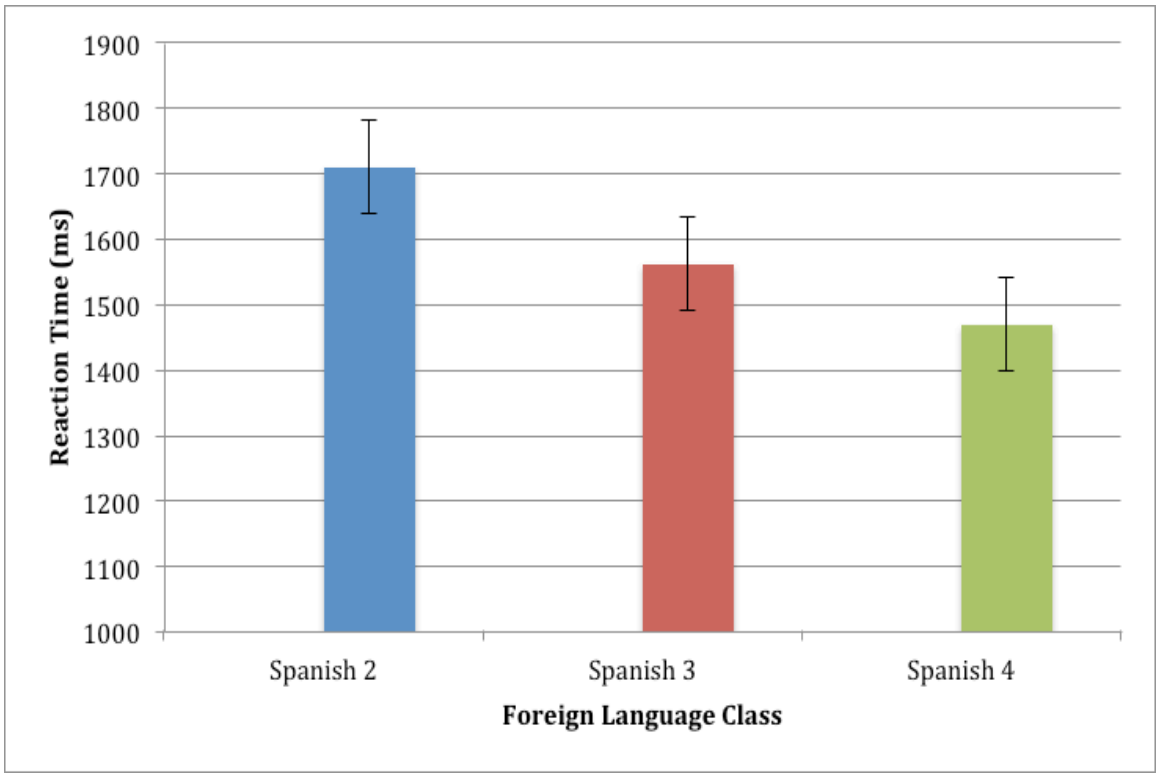

Figure 6. **Image/word incongruent, Spanish**

Priming Discourse

Accuracy on Priming Discourse Comprehension Questions

The researcher examined the participants' percent correct responses across the three questions by their foreign language fluency collapsed across the stories. The researcher collapsed the percent correct across the priming discourse stories, as the type of question and not each individual story was of primary concern. For the foreign language class variable, the sizes of the groups were reasonably comparable to one another (Spanish 2: 60 participants; Spanish 3: 55 participants; Spanish 4: 66 participants). See Figure 7 for the percent correct for the three question types across the three levels of foreign language class for the priming discourse when the language of presentation was English. See Figure 8 for the percent correct for the three

question types across the three levels of foreign language class for the priming discourse when the language of presentation was Spanish.

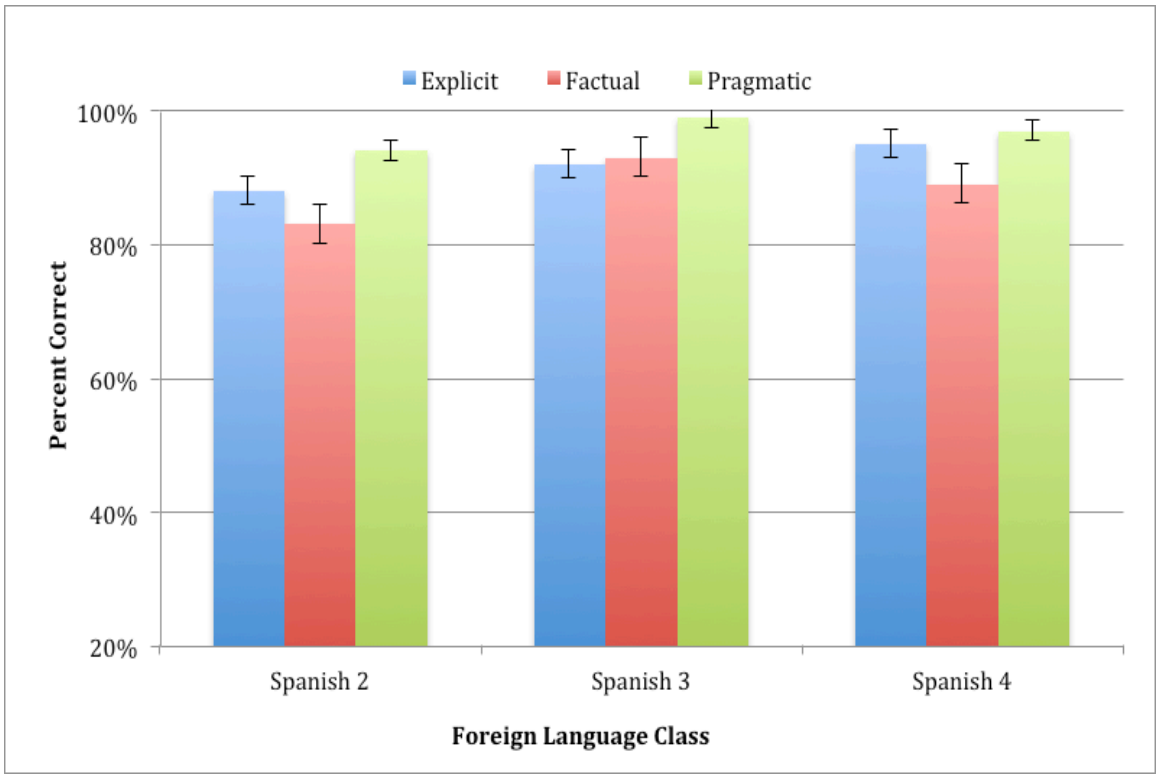

Figure 7. **Percent correct for question type by foreign language class, English**

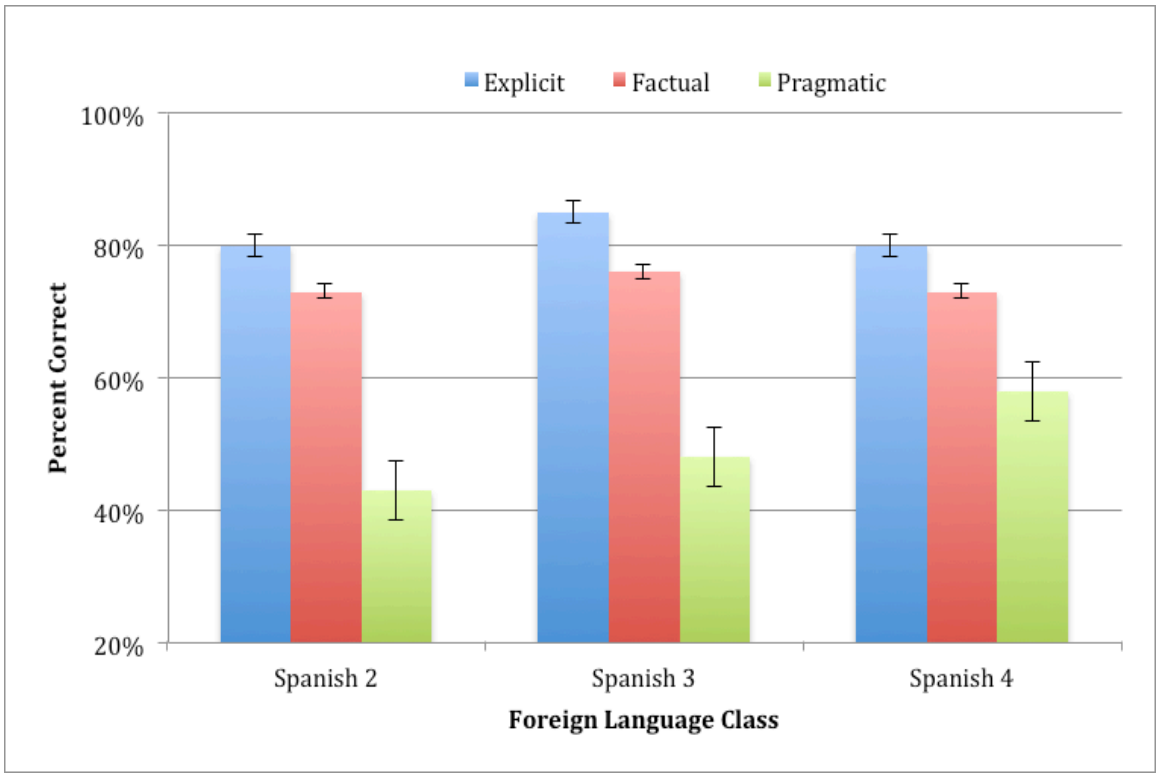

Figure 8. **Percent correct for question type by foreign language class, Spanish**

A 3 (question type: explicit, factual, pragmatic) x 2 (language: English, Spanish) x 3 (foreign language class: Spanish 2, Spanish 3, Spanish 4) mixed ANOVA examined the relationship of priming language, question type, and foreign language class on accuracy. Question type and priming language were treated as within-subjects variables and foreign language class was treated as a between-subjects variable in the analysis.

There was a large main effect of priming language on question accuracy, $F(1, 178) = 191.87$, $p = .001$, $\eta_p^2 = .52$, indicating that participants had a higher accuracy on the comprehension questions when the priming discourse was in English than when it was in Spanish (English: M = 92%, SD = .09; Spanish: M = 69%, SD = .02). This result provides support for H8a.

There was also a main effect of question type, $F(2, 178) = 29.37$, $p = .001$, $\eta_p^2 = .14$, indicating that participants were most accurate on the explicit question, and least accurate on the pragmatic question (Explicit: M = 87%, SD = .01; Factual: M = 81%, SD = .01; Pragmatic: M = .73, SD = .01). Moreover, the three question types were all significantly different from each another, as indicated by the Bonferroni post hoc comparison. This result provides support for H6b.

The language by question type interaction was also significant, $F(2, 178) = 62.50$, $p = .001$, $\eta_p^2 = .26$. Further analysis revealed that across the three question types, for English, accuracy on the explicit and the pragmatic question were significantly different from one another, and pragmatic and factual were significantly different, although factual and explicit did not significantly differ. For Spanish, all three of the question types were significant different from one another, with participants performing the worst on the pragmatic question.

The language by foreign language class interaction was not significant, $F(2, 178) = .15$, $p = .86$, $\eta_p^2 = .002$, nor was the question type by foreign language class interaction, $F(4, 178) = 1.0$, $p = .41$, $\eta_p^2 = .011$, or the 3-way interaction of question type, foreign language class, and language, $F(4, 178) = 2.4$, $p = .06$. As the 3-way interaction was not significant, H5b was not supported and as there was no interaction between L2 proficiency and question type, H7 was not supported.

Reaction Time on Priming Discourse Comprehension Questions

After examining accuracy on the question types as a function of foreign language class and language of the priming language, the researcher examined the reaction times for participants to respond to the questions about the priming discourse. The responses for the

question types were collapsed across all stories prior to the analyses; incorrect responses were removed as well as their corresponding reaction times and the data were trimmed similarly to the MPWI data. After removing all the incorrect responses, the group sizes were smaller, yet still relatively comparable to one another (Spanish 2: 38 participants; Spanish 3: 41 participants; Spanish 4: 52 participants). The group sizes became smaller, as some participants got enough questions wrong to result in empty cells. See Figure 9 for mean response time for each question type for each foreign language class when the priming language was English. See Figure 10 for mean response time for each question type by foreign language class when the priming language was Spanish.

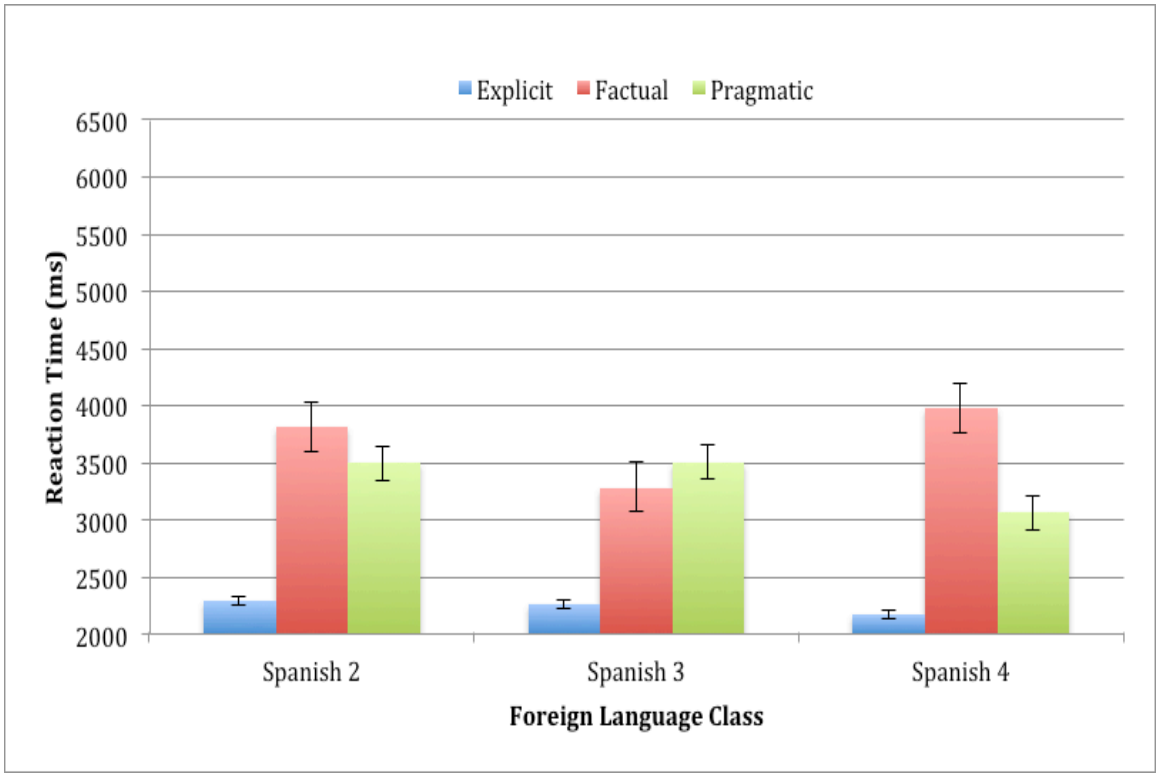

Figure 9. **Mean response time for each question type by foreign language class, English**

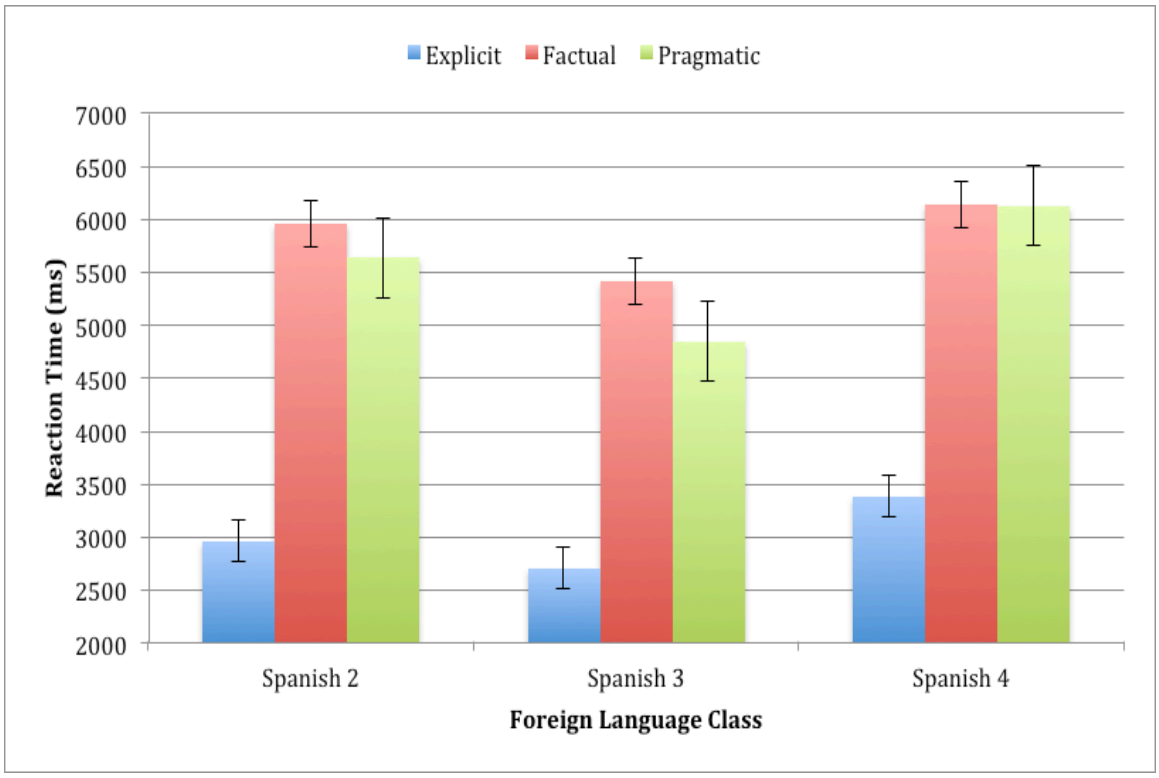

Figure 10. **Mean response time for each question type by foreign language class, Spanish**

A 3 (question type; explicit, factual, pragmatic) x 3 (foreign language class; Spanish 2, Spanish 3, Spanish 4) x 2 (language; English or Spanish) mixed ANOVA was conducted with question type and prime language treated as within-subjects variables and foreign language class treated as a between-subjects variable.

There was a large main effect of language, $F(1, 131) = 108.84$, $p = .001$, $\eta_p^2 = .46$, indicating that participants took significantly longer to respond when the questions were in Spanish than English. This result provides support for H8b. There was also a main effect of question type, $F(2, 131) = 104.83$, $p = .001$, $\eta_p^2 = .45$, indicating that participants responded to the explicit question fastest, and significantly longer for both the factual question and the pragmatic question Pairwise comparisons revealed that response time for the explicit question

was significantly different from the factual and pragmatic questions; however, response time for factual and pragmatic did not significantly differ. With this result, we see partial support for H6a.

The language by question type interaction was significant, $F(2, 131) = 9.91$ $p = .001$, $\eta_p^2 = .07$. Further analysis of the interaction revealed that the mean reaction times for all three question types were significantly different from one another across the two languages. There was a significant, but small, difference on the explicit questions, and a significantly bigger difference found for the factual question and the pragmatic, but the language differences for the factual and pragmatic questions were very similar.

The question type by foreign language class interaction was not significant, $F(4, 131) = .31$, $p = .87$, nor was the interaction between language and foreign language class, $F(2, 131) = 2.36$, $p = .09$, nor the 3-way interaction of foreign language class, question type, and language, $F(4, 131) = 1.00$, $p = .40$. As such, H5a was not supported.

Chapter 4 - Discussion

The present study investigated whether priming for a target language (L1 or L2) with a short passage of discourse affected intermediate language learners' performance, in terms of both accuracy and reaction time, on (a) a modified picture-word interference task and (b) responses to comprehension questions of varying complexity about the priming discourse. As the ability to effectively and accurately switch back and forth between one's two languages is a crucial skill for foreign language learners, it is important to develop a stronger understanding of exactly how bilinguals of various levels of L2 fluency do this and what contributes to this important skill.

Similar to the organization of the results section, the discussion is separated into distinct sections. The first section discusses and interprets the results of the MWPI task in terms of the

revised hierarchical model (Kroll & Stewart, 1994). The second section discusses the results of the priming discourse comprehension questions. The final section discusses possible limitations of the study and directions for future research are addressed.

MPWI Task

It was initially predicted that when the language of the priming discourse and the language of the MPWI task were the same, e.g., all-English or all-Spanish conditions, these conditions would produce faster reaction times, as they did not require the participant to switch between the two languages, in comparison to the switch conditions (e.g., English discourse, Spanish task and vice versa). The interaction between priming language of the discourse and the language of the task partially supports Hypothesis 1; participants did perform faster on the task when the language of the priming discourse was congruent with the language of the task, however, this was not significantly different when compared to the switch conditions (Figure 5).

Participants had a higher percent correct on the MPWI task when the language of the task was in English than when in Spanish (Figure 1). Moreover, participants were also faster at responding on the MPWI task when it was in English than when the task was in Spanish (Figure 3), with the effect sizes for both accuracy and reaction time being quite large. As participants were more accurate and performing faster for English than Spanish, these results provide support for H4a and H4b.

The most likely explanation for these results is the highly asymmetrical level of fluency between participants' L1 and L2 (Kroll & Stewart, 1994; see also Meuter & Allport, 1999). The participants in the study were intermediate Spanish L2 language learners who had been studying Spanish for approximately 1 ½ - 2 years, not considering the very small number of participants

who were fluent. The results of the study suggest that even after 1 ½ - 2 years of second language learning, the relationship between the L1 and the L2 is still quite asymmetrical in structure, with the L2 clearly the much weaker of the two languages.

To see if the observed effects from the present study would be found for more advanced L2 learners, it would of interest for future research to examine participants who had a higher level of fluency in L2 but who were still short of native fluency, e.g., Spanish Conversation. After approximately the first two years of second language learning, this asymmetrical relationship that exists between the two languages starts to diminish as the bilingual becomes more balanced between the two languages. I would anticipate that there would be less L1-L2 difference in accuracy, but more interestingly, there would be less difference between reaction time, compared to the present findings. I would anticipate less difference in reaction time on a similar task as the bilingual, now relatively more proficient in both languages, would be able to switch back and forth more readily along the language mode continuum (Grosjean, 2008) with greater ease. Additionally, in terms of the revised hierarchical model, I'd suspect that these advanced L2 learners would also have little to no difficulty when translating from L2 to L1, as the relationship between the two lexicons is primarily at the lexical level and this relationship is usually established first. What's more, this developmental shift of translating from L2 to L1 via the lexical link to the accessing and retrieval of the conceptual representation through the L2 lexical items would already be in place, and so we would see these advanced L2 learners having little difficulty accessing the conceptual representation through the L2 lexical items. After increased L2 language exposure, the asymmetrical relationship between the L1 and the L2 will begin to diminish, allowing the bilingual to access and retrieve information faster.

Exploring foreign language fluency, participants responded faster across all foreign language fluency classes, with reaction time decreasing as L2 fluency increased. Across the intermediate levels of foreign language fluency, participants who were more proficient in their L2 (Spanish 4 and beyond) performed faster on the task than those of lower fluency. This result of faster reaction time for those possessing higher foreign language proficiency provides support for Hypothesis 2a. Participants in the Spanish 2 group were slower to respond in the MPWI task than were those in Spanish 3, but not much. However, those in Spanish 4 performed faster on the task than those in either Spanish 2 or Spanish 3 (Figure 5), although this did not affect their accuracy on the task, as participant accuracy on the task was still quite high. In addition to observing an interaction between the language of the priming discourse and the language of the task, there was also an interaction between language and foreign language class for accuracy. This interaction indicated that in English, the participants scored exceptionally high, regardless of their L2 proficiency. However, examining their performance in Spanish, the interaction revealed that those who were more fluent had a higher percent correct than those of lower fluency (Figure 2). Given these results, it appears that L2 fluency, at least at the intermediate level, affects processing time more than accuracy.

The task in the study required participants to determine if an image/word pair was congruent (image/word match) or incongruent (image/word do not match). As they did, they were required to activate the lexical information for the word and the semantic representation for the image at the same time. When switching languages (e.g., English language priming discourse and Spanish MPWI task), especially when the task is in the L2, it can require more cognitive processing. The lexical and semantic information for the previously activated language remains highly active or more active than the newly activated information. This language priming (or

switching) did not affect their accuracy, as they were still able to effectively discriminate if the image/word pairs were congruent or incongruent with relatively high accuracy in the Spanish conditions. In the English conditions, they scored exceedingly well and were also able to respond relatively quickly. Thus, even by Spanish 2 (after approximately 6 months -1 year of L2 language learning), participants were adequately skilled in Spanish to make the congruence judgments accurately.

Revised Hierarchical Model

Interpreting the MPWI results in light of the revised hierarchical model (Kroll & Stewart, 1994), when having to discriminate between the image/word pairs in the MPWI task, participants who were less fluent are relying more heavily on this lexical connection between their L2 and their L1. Whereas, those participants who were more fluent were no longer having to rely on the lexical link and were able to retrieve and select the correct lexical and conceptual information for the image/word pair in the L2. When examining the results of L2 image/word incongruency, results indicated that those who were more fluent were faster at identifying that the image/word pair did not match than those who were less fluent. With the image/word pairs, the lexical as well as the conceptual information is being activated at the same time, and these more fluent participants were quicker at retrieving this information and determining that the two did not match. Those who were less fluent were not as fast as the higher fluency participants, as they were still having to search through the lexicon of their L2 and translate to their L1 in order to determine if the retrieved lexical and conceptual information match or not.

Unlike Kroll and Stewart (1994), the present study utilized a lower, yet wider, range of L2 fluency, approximately 1 ½ years of L2 experience, whereas the participants in Kroll and

Stewart were highly fluent, Dutch–English bilinguals. Considering the results in light of the revised hierarchical model (Kroll & Stewart, 1994), the results of the present study are consistent with their model, at least for the lexical route from L2 to L1. The present study was unable to directly address and test the conceptual route of the revised hierarchical model, as Kroll and Stewart's methodology required the participants to verbally translate categorized and mixed lists of words from L1 to L2 and vice versa.

When fluency is low, to access the information for the word in L2, the participants were using the lexical route, which is what is exactly in line with the model. However, as they become more proficient in their L2, the participants still utilized this lexical route for words only. Yet, when seeing the image, they must rely on the conceptual route for access and retrieval.

There were no significant effects on reaction time for either image/word congruent or incongruent when in English; participants were able to discriminate and respond equally well and rapidly, when the image/word pair matched as well as when the image/word pair did not. Yet, there was a significant effect when image/word pairs were incongruent and in Spanish. The latter results suggested that those who had a higher proficiency in their L2 were faster at discriminating between the image/word pair and correctly rejecting when they did not match than were those with lower proficiency.

When the image/word pair was congruent (match) and in the L2, the lexical information was retrieved first and after this, the conceptual information was activated and provided them with the information to identify the right word for that particular lexicon. When the participants have a higher level of fluency, they were accessing the L2 lexical information for the image with the aid of the word. For example, if participants saw an incongruent image/word pair in L2 (image of a house | *PERRO*), participants based the retrieval of the semantic information of the

image on the language that is currently activated and are less likely to consider the lexicon of the lesser-activated language. So from the previous example, as the L2 lexicon is the more readily available and activated, participants are likely to retrieve the conceptual information for the image of a house from the L2 lexicon and less so from the L1 lexicon, as the lexical information of *PERRO* can help act as a cue for what lexicon to search.

Finally, with respect to Grosjean's (2001; 2008) language mode continuum, the results of the study suggest that those participants who were more fluent are capable of moving along this continuum more easily than those who were less proficient. This seems rather straightforward; as participants gain more exposure and experience with their second language, they are better able to move on the continuum. As these second-language learners become more proficient in their L2, they are becoming better at maneuvering along the language mode. The language not in use is not entirely deactivated, but rather is at a lower level of activation (Gullifer, Kroll, & Dussias, 2013; Macnamara, 1967; Macnamara & Kushnir, 1971). If the language were entirely deactivated, we would have expected to observe an even greater increase in reaction time in the switching condition than what was observed in the present study.

Priming Discourse Questions

Concerning the comprehension questions after the priming discourse passage, participants had the highest percent correct for the explicit questions and the lowest accuracy for the pragmatic questions, thus providing support for Hypothesis 5b. Here we see somewhat similar results to the MPWI task; participants were less accurate and typically took longer to read and respond when the questions were in Spanish than if they were in English, thus providing support for both H8a and H8b. However, we see something that goes against an initial

prediction; across the 3 types of questions (explicit, factual, and pragmatic), participants took slightly longer to respond to the factual question than to the pragmatic question, although the two question types did not significantly differ. Given this result, Hypothesis 6a was not fully supported.

One could make the argument that participants took the longest to respond to the pragmatic questions because they were the longest in length of the three types of questions and thus would naturally take longer to read and respond to. This argument, however, is not consistent with the results of the present study. Despite the pragmatic questions being the longest of the three questions types, it was actually the factual question that participants took the longest to respond to. Moreover, we see similar results in the interaction between language and question type; the participants took longer on the factual question when it was in Spanish than they did the pragmatic question in Spanish (Figure 10). If word length were driving this effect and this interaction, we would expect a greater difference and longer reaction times for the pragmatic question; however, this is not the case for the present study. As there was no interaction between foreign language proficiency and question type on either reaction time or accuracy, hypothesis 7 was supported.

The interaction between question type and language on accuracy revealed that the participants had more difficulty answering the questions in Spanish, and scored progressively worse as the question became more difficult and required the readers to go beyond the provided information. Likewise, they took significantly longer to respond to the questions in Spanish in comparison to when the questions were in English. Interestingly, there was an interaction of language and question type; however, there was no interaction between foreign language proficiency and the type of question.

Hulstijn and Bossers (1992) investigated the potential individual differences in L2 proficiency and how these differences may be a function of the individual's proficiency in their L1. Hulstijn and Bossers showed that L2-specific knowledge, e.g., their knowledge of the language as well as their knowledge of grammar and vocabulary, was more important than their L1 reading ability. Other research has suggested that there is a mutual relationship between one's L1 reading ability and their L2 language proficiency (Yamashita, 2002). Taken together, it merits further research to better understand exactly how L2 proficiency can affect a reader's ability to read and comprehend in their L1.

Previous studies have indicated that it typically takes longer to respond to a pragmatic question than a factual or textbased question (Burgoyne, Whiteley, & Hutchinson, 2013; Rai, Loschky, Harris, Peck, & Cook, 2011; Rai, Loschky, & Harris, 2015). A pragmatic inference requires the reader to go beyond the information present and have them draw an inference from the information. As such, they should require longer time to construct a situational model and new representation from the material presented. In the present study, however, in most cases, the pragmatic and the factual question did not significantly differ, although they did differ in accuracy when participants answered in Spanish. One possible reason for these results is a decay effect; the questions after the discourse appeared in the same order for each story and appeared in the same order as the corresponding material in the priming discourse. As the explicit question was the easiest of the three, we would expect the highest accuracy and lowest response time. After the reader had answered the explicit question, perhaps by the time the readers reached the factual and pragmatic question, the lexical and semantic information of the prime might have started to deteriorate, more dramatically for Spanish and less so for English.

Applying Kintsch's (1998) model to bilinguals, Raney, Obeidallah, and Miura (2002) discuss text comprehension in bilinguals and how bilinguals read, comprehend, and store text information. Raney et al. concluded that proficient bilinguals form similar representations for text in both their L1 and their L2; being highly fluent bilinguals, the levels of Kintsch's text comprehension have been developed for each language. Similarly, less proficient bilinguals are also forming representations based on the three levels; yet, the context of less proficient bilinguals' representations is contingent on their fluency. Less proficient bilinguals focus more on the lower levels of the model, e.g., the surface form and textbase, and have more difficulty creating situational models. The results from the present study are consistent with Raney et al.'s application of Kintsch's model to bilingual text comprehension and show the importance and relevance of studying bilinguals of intermediate levels of fluency.

Recent studies have discussed the implications of working memory (WM) and L2 comprehension, in that those with larger working memory capacity excel over those with lower working memory capacities (Daneman & Carpenter, 1980; van den Noort, Bosch, & Hugdahl, 2006). Moreover, previous research has shown that it takes considerable time to construct and understand inferences, especially those that require the reader to go beyond the present information. This longer time to process and construct information surely taxes the readers' working memory capacity. Estevez and Calvo (2000) showed that, although readers of both high and low working memory were able to successfully draw predictive inferences in on-line processing, high working memory readers were faster at making these inferences. Estevez and Calvo go on to explain that this advantage for high working memory readers is the result of being able to hold on these lexical items and words in WM longer and are able to construct new meaning.

Limitations and Future Directions

One conceivable limitation of the current study was the ease of the MWPI task. The words used in the task were all high frequency, concrete words, which may have played a role in the relatively low difficulty level of the task. This ease of the task can also be seen in the high accuracy responses in English and the lower, yet still relatively high accuracy in Spanish, can attest to this as well. With the ease of the MPWI task, future research might include more difficult items in the task portion or perhaps vary the level of difficult in the task (have a mixture of easy and difficult trials).

Another possible limitation of the study was the strength or lack of strength of the priming discourse. For each language, the stories acting as the priming discourse were relatively short in length, ranging from approximately 135 to 160 words. It is possible that perhaps the priming discourse was not long enough in length to act as an effective prime for the intended language. The lack of a priming discourse effect can attest to this possible limitation as well. Future studies could employ substantially longer passages to act as priming discourse in hopes of shifting the bilingual to the right mode for priming on the language mode continuum. Additionally, rather than presenting the material one sentence at a time, as this can be a cognitively demanding task, especially if the priming discourse is in the participants' L2, the priming discourse may be presented all at once.

A number of studies have suggested that there is a relationship between second language usage/acquisition and working memory (Ardila, 2003; Osaka & Osaka, 1992). Another avenue for future research would be to include a measure of working memory to see if being bilingual can aid in holding more information in WM. Van den Noort, Bosch, and Hugdahl (2006) investigated the effects of foreign language fluency on working memory capacity, to test whether

the interaction between foreign language fluency and working memory capacity was language-specific. They examined native speakers of Dutch who were also fluent in German (L2) and were in the process of learning Norwegian (L3), comparing across native German and native Norwegian speakers. They showed that, as the person moved along their languages, from L1 to L2, and from L2 to L3, the amount of available WM resources began to diminish, as measured by a digit span and a reading span task (Daneman & Carpenter, 1980).

The present study employed priming discourse (brief stories) that presented one sentence at a time in either English or Spanish. Having to hold each sentence in one's WM and then connect the sentences to make a comprehensible story can be a rather difficult task. The task can take more time if the information is presented in the participant's less dominant language. As suggested from previous research on second language usage, perhaps those who have a greater command in their second language possess a greater WM capacity as they are required to hold two active pieces of linguistic and semantic information at a time, one for each of their activated languages (van den Noort et al. 2006).

One potential avenue for future research could be to examine the possible differences between logographic, e.g., Chinese, and alphabetic languages, e.g., English, in regards to the picture-word interference task. Most of the literature on the picture-word interference task has used alphabetic languages and it would be interesting to see if similar results would be obtained with logographic languages. Logographic languages represent one morpheme per orthographic symbol, and as such, it would be interesting to think how a English–Chinese bilingual, for example, would perform on a MPWI task with logographic characters. With the revised hierarchical model (Kroll & Stewart, 1994), I would argue that these English–Chinese bilinguals would rely more heavily on the conceptual link, as the logogram would provide additional

information that the lexical item may not be able provide, at least initial in the early stages of L2 development. Another possibility to consider is how would tonality of the word affect lexical and semantic retrieval. The task would require the bilingual to process an image and the congruent logographic symbol for that image. In essence, the bilingual would be viewing two images; the logogram and the image itself; however, the logogram may provide more information to the bilingual than would the image alone. This would surely be contingent on their foreign language fluency, as one could suspect that as they become more fluent in their L2, the lexical and semantic information for the logogram and the referent of that image would be accessed in quick succession if not at the same time.

Another avenue for future research could be to incorporate pronounceable pseudowords and non-pronounceable letter strings into the MPWI task. In the present study, there were two conditions on the MPWI task, only allowing comparisons between the two. However, by including non-words, or pseudowords that obey the orthographic rules of a particular language, however have no literal or semantic meaning, e.g., FLORK, BLOH, etc., and letter strings, e.g., LPXLT, PETGHIJL, etc., this would allow comparison across the conditions (pseudowords, English, Spanish, letter strings). There have been reaction time studies in bilingual lexical selection that have incorporated non-words, however, these have not included a measure of language priming. One could argue that when primed with a specific language, reaction times to non-words and letter strings that are consistent with that language would be comparable to those of the other language. This would shed further light on how bilinguals process linguistic information in their L2 and how they are able to distinguish when a word/phrase may or may not be a part of a particular language.

Finally, there are practical implications of this study, specifically for second-language educators. From the results of the study, it was consistently found that those in Spanish 4 and above (high fluency) were typically more accurate and faster at discerning if an image/word pair was either congruent (match) or incongruent (do not match) than those in Spanish 2 (low fluency). Moreover, these high fluency participants were also typically more accurate and responded faster on comprehension questions that varied in complexity from a short paragraph of discourse than low fluency participants. From the interaction between the language of the task and foreign language class, the means were all significantly different from one another, suggesting that as second-language learners gain more linguistic knowledge in their L2, they are becoming better at being able at identifying, accessing, and retrieving the correct lexical item in the L2. Being able to read passages in an L2 and extract information from them is also a critical skill for second-language learners. The present study indicates that these second-language learners have great difficulty in drawing inferences from short passages early on. However, by a year later, they are doing progressively better. This is interesting to note because comparing performance in their L1, they are having little to no difficulty in extracting this information. However, when in the L2, it is more difficult, but they become better as their fluency increases. The study provides insight into how quickly and accurately these second language learners are able to access and extract information from passages, and into bilingual information processing overall. As a second-language educator, the results of this study are beneficial and worth knowing, in being able to develop new pedagogical approaches to second-language learning. This finding goes against the finding of Kroll and Stewart's revised hierarchical model (1994) that this developmental shift occurs at around two years or so of L2 language learning. The

present study goes beyond Kroll and Stewart and suggests that this shift may be occurring earlier than originally thought.

From the present study, we see that as intermediate L2 language learners become more proficient in their second language, they are able to outperform those who have less language exposure on certain tasks, specifically, a yes/no picture/image pair task and comprehension questions which vary in complexity. The differences in language deficits become more apparent on different tasks, e.g., they affect time to respond to a task much more than accuracy for that task. Additionally, these deficits become more obvious depending on question complexity, such that those more fluent intermediate L2 language learners perform faster and are more accurate on questions of greater complexity than those less fluent intermediate L2 language learners. These results provide evidence suggesting the need for more research to examine and include different levels of intermediate L2 fluency rather than solely examining highly fluent bilinguals. From the observed results, it surely raises questions for further research on bilingual language activation and usage.

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Appendix A - Language Mode Model

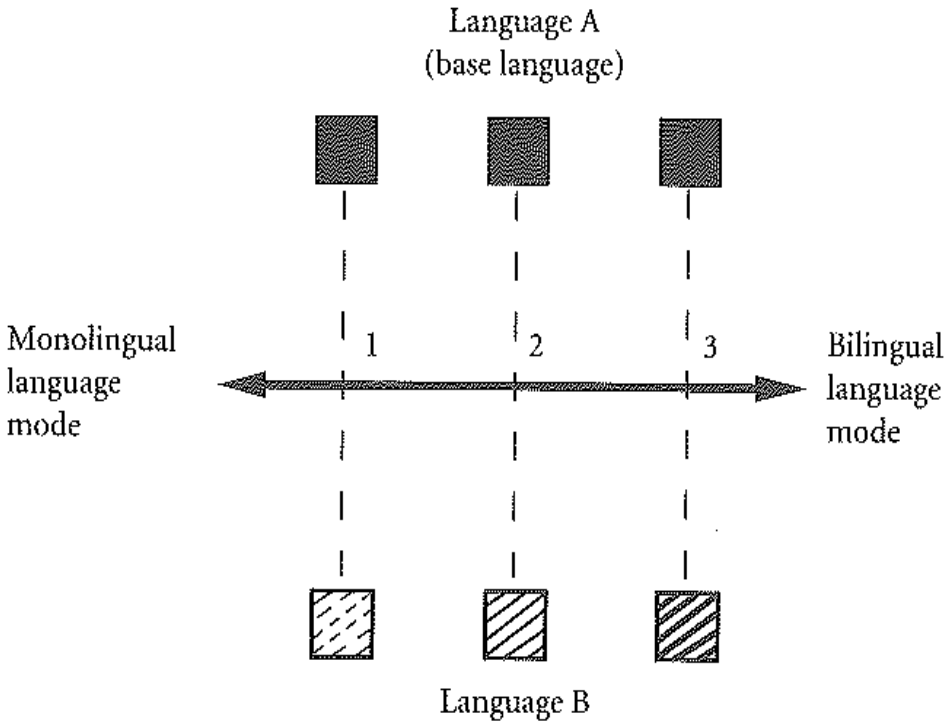


Figure A.1. **Grosjean (2001; 2008) Language Mode Model**

Appendix B - Revised Hierarchical Model

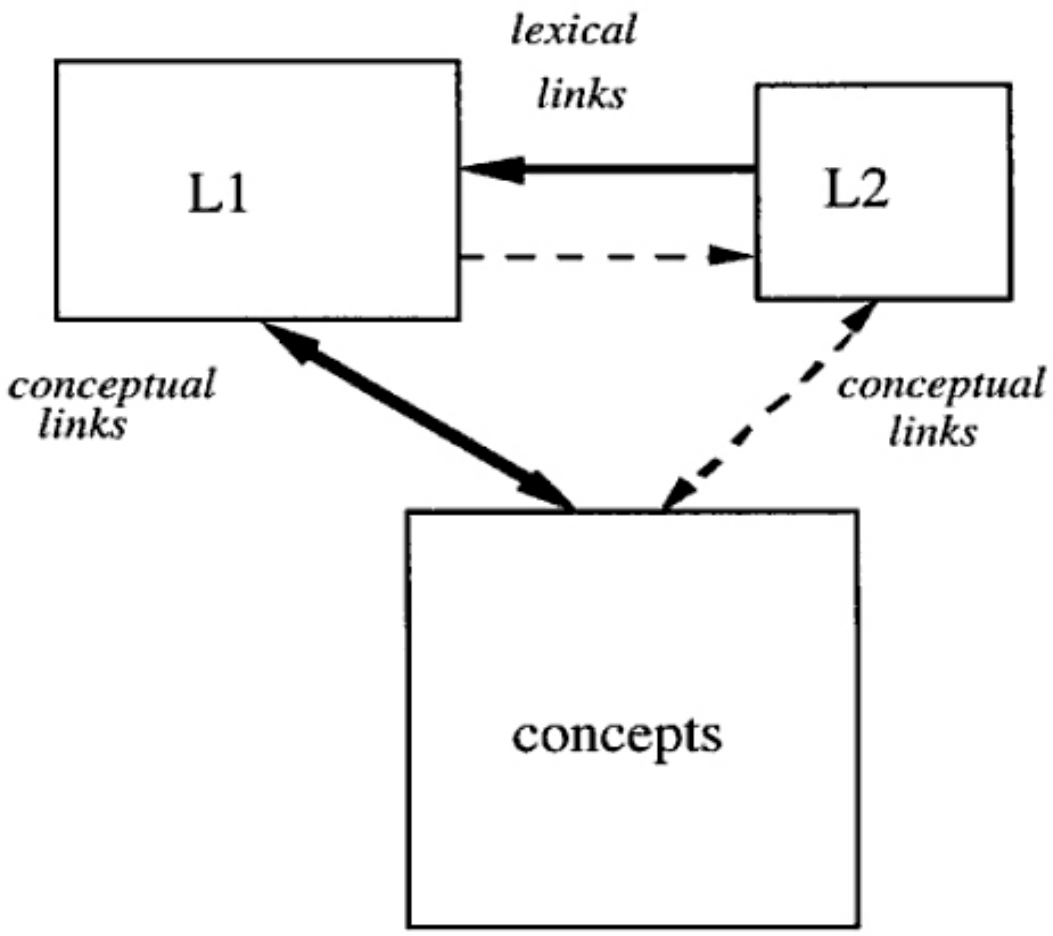


Figure B.1. **Revised Hierarchical Model (Kroll & Stewart, 1994)**

Appendix C - Perceived Fluency Scale

Age: _____ years Gender: M_____ F_____

Place of birth (city, state/province, country): _____

Nationality (e.g., U.S., Mexican, Canadian): _____

Gender: M F

Year in school (circle one): Freshman Sophomore Junior Senior Graduate

What is your major? _____

A. Is English your **native language** (i.e., the very first language you learned)? Y N If not, what is it? _____

B. Please list all the languages you speak, understand, are formally studying, or have studied in the past:_____

_____

C. Have you ever visited/studied abroad in a Spanish-speaking country? circle one: Y N

If so, how long were you there and how long ago? _____

D. What is the highest level of English classes that you have taken? (i.e. English Comp I, etc.).

_____

E. Do you currently have any family or close friends who are fluent in a language other than English? circle one: Y N Name the language: _____

If so, do you speak with them in that language? circle one: Y N

If so, how often? _____hours per… circle one: day week month year

F. How would you rate your current **listening** skills in English?

Very Poor 1———2———3———4———5——6———7 Fluent

How would you rate your current **speaking** skills in English?

Very Poor 1———2———3———4———5——6———7 Fluent

How would you rate your current **reading** skills in English?

Very Poor 1———2———3———4———5——6———7 Fluent

How would you rate your current **writing** skills in English?

Very Poor 1———2———3———4———5——6———7 Fluent

G. If you are taking or have taken any foreign language classes on campus, which class(es), and what level are you currently in?(or what was the highest level you completed?)

_____

H. How would you rate your current **listening** skills in Spanish?

Very Poor 1———2———3———4———5——6———7 Fluent

How would you rate your current **speaking** skills in Spanish?

Very Poor 1———2———3———4———5——6———7 Fluent

How would you rate your current **reading** skills in Spanish?

Very Poor 1———2———3———4———5——6———7 Fluent

How would you rate your current **writing** skills in Spanish?

Very Poor 1———2———3———4———5——6———7 Fluent

Appendix D - Priming Discourse & Comprehension Questions

Practice Trial

Taylor was sitting in the library, his face deep in his textbook. Taylor's physics final was tomorrow morning at 7:45 a.m. and he needed to do well on it to pass the class and be eligible to graduate. The library was a lonely place at 3:30 in the morning. He had been studying for at least 6 hours, but he still felt unprepared. Taylor decided to it was time to take a break. Taylor got up from the table and began to walk around the library. Soon after, Taylor jumped up on a table and began to dance! He jumped from table to table, shuffling and kicking his feet as he laughed. It was a shame that Taylor didn't see the security guard who had just watched his entire dance fiasco until it was too late.

1. What time in the morning was Taylor's exam? (Explicit question)

A) 7:30 a.m. C) 7:45 a.m.

B) 8:00 a.m. D) 3:30 a.m.

Very uncertain 1———2———3———4———5——6———7 Completely Certain

2. Why was this test so important to Taylor? (Factual question)

A) He needed to boost his GPA C) To impress his girlfriend

B) Needed to pass to graduate D) To impress his parents

Very uncertain 1———2———3———4———5——6———7 Completely Certain

3. How many other students were studying in the Library that night**? (**Pragmatic inference question)

A) None C) 0

B) 1 D) 3

Very uncertain 1———2———3———4———5——6———7 Completely Certain

Priming Discourse & Comprehension Questions, English

Story #1

Susan had been saving up for a brand new bicycle. Her parents gave her $5 a week for completing her chores. The new bicycle that Susan wanted to buy cost $110, but Susan didn't have enough money. One day, Susan went into her mother's purse and took $10. Her mother noticed that the money was missing from her purse and confronted Susan. At first, Susan had lied to her mother and told her that she did not take the money from her purse. Susan's mother said that if she did not tell her the truth, Susan would be punished and not able to go to her friend Megan's birthday party. Susan confessed to her mother for taking the money. In the end, Susan didn't get her allowance for 3 weeks and was not allowed to go to her friend's birthday party.

1. How much did money did Susan take from her mother's purse? (Explicit question)

A) $10 C) $15

B) $5 D) $20

Very uncertain 1———2———3———4———5——6———7 Completely Certain

2. What was Susan not allowed to attend because she stole the money? (Factual question)

A) School C) Birthday party

B) Pool party D) Sleepover

Very uncertain 1———2———3———4———5——6———7 Completely Certain

3. Besides stealing the money, what else was Susan punished for? (Pragmatic inference question)

A) Cheating on a test C) Getting upset

B) Misbehaving D) Lying

Very uncertain 1———2———3———4———5——6———7 Completely Certain

Story #2

As Clint and his friends pulled into the amusement park parking lot, he was extremely nervous and his heart began to beat fast. After paying the admission price of $29.95, they finally got into the park and were surrounded by all sorts of rides. Clint's friends urged him to ride one ride with them, and after much thought, Clint said he would. Clint's friend Tony picked the fastest and tallest ride in the whole park for them to ride: Speed Mountain. His friends told him not to worry and that it would be fun. Next in line for the ride, they got in the seats and strapped in. As soon as they strapped themselves in, the coaster took off. Clint screamed and yelled and wanted to get off the coaster, but soon after, he was enjoying the coaster! As soon as the coaster ride ended, Clint was running off trying to decide which coaster to ride next.

1. How much did it cost to get into the amusement park? (Explicit question)

A) $40.95 C) $29.95

B) $25.50 D) $95.25

Very uncertain 1———2———3———4———5——6———7 Completely Certain

2. What type of ride did Clint's friend choose? (Factual question)

A) The longest C) The newest

B) The fastest D) The one nearest the gate

Very uncertain 1———2———3———4———5——6———7 Completely Certain

3) How many times has Clint been to an amusement park before? (Pragmatic inference question)

A) 7 C)

B) 0 D) 6

Very uncertain 1———2———3———4———5——6———7 Completely Certain

Story #3

John was driving on I-70 to Kansas City for the job interview of a lifetime. He had recently applied for a research position at a new company and had received a call back for an interview. John made sure that he had left early just to ensure that he would make it to Kansas City on time. John was typically someone who would wait to the last minute to do something. Yet he wasn't going to wait until the last minute to leave his house and wanted to be prompt and present for the interview. Halfway there, John heard a loud "POP!" and instantly began to swerve. John regained control of his truck and pulled over to the side of the road and knew his worst fear had come true.

1) Where was John's interview? (Explicit question)

A) Kansas City C) Dodge City

B) Topeka D) Lawrence

Very uncertain 1———2———3———4———5——6———7 Completely Certain

2) What job position did John apply for? (Factual question)

A) Manager C) Truck Driver

B) Research team D) Librarian

Very uncertain 1———2———3———4———5——6———7 Completely Certain

3) What did the loud "POP" suggest to John? (Pragmatic inference question)

A) Something wrong with engine C) Hit an animal

B) Flat tire D) Something fell off his truck

Very uncertain 1———2———3———4———5——6———7 Completely Certain

Story #4

Edward was somewhat of a loner. He liked to go fishing at the lake by himself and bring a cooler full of snacks to enjoy with his dog. One day, Edward decided to try night fishing and got to the lake at 9 p.m., rather than his usual 5 a.m. Despite his best efforts to get some vision by keeping his car lights on behind him, he could hardly see. As he was eating a turkey sandwich, he heard his dog barking at his fishing line. Edward ran over to his pole and gave a good pull. He couldn't see what was going on, but he suspected it was a real big fish! Finally on the last pull Edward fell backwards and a baby crocodile came crawling out of the water with the hook in his mouth!

1) What time did Edward usually go fishing? (Explicit question)

A) 9 a.m. C) 11 a.m.

B) 5 p.m. D) 5 a.m.

Very uncertain 1———2———3———4———5——6———7 Completely Certain

2) What kind of sandwich was Edward eating? (Factual question)

A) Ham C) BLT

B) Turkey D) Bologna

Very uncertain 1———2———3———4———5——6———7 Completely Certain

3) What did the dog barking suggest to Edward? (Pragmatic inference question)

A) The dog was frightened C) There was something on the fishing line

B) Someone was coming D) The dog was in the water

Very uncertain 1———2———3———4———5——6———7 Completely Certain

Priming Discourse & Comprehension Questions, Spanish

Story #1

Susan había estado ahorrando para comprar una bicicleta nueva. Sus padres le dieron $5 a la semana por completar sus tareas. La nueva bicicleta que Susan quería comprar tiene un costo de $110, pero Susan no tenía suficiente dinero. Un día, Susan entró al bolsa de su madre y se llevó $10. Su madre se dio cuenta de que faltaba el dinero de su bolso y enfrentó a Susan. Susan le mintió a su madre y le dijo que ella no tomó el dinero de su bolso. La madre de Susan, dijo que si ella no le dijo la verdad, Susan sería castigada y no podria ir a la fiesta de cumpleaños de su amiga, Megan. Susan confesó a su madre para tomar el dinero. Al final, Susan no recibió su subsidio durante 3 semanas y no le permitieron ir a la fiesta de cumpleaños de su amiga.

1. ¿Cuánto dinero tomo Susan de la bolsa de la madre?

A) $10 C) $15

B) $5 D) $20

Muy inseguro 1——2——3——4——5——6——7 Completamente seguro

2. ¿Qué es lo que Susan no le permitirán atender por ella robándose el dinero?

A) La escuela C) La fiesta de cumpleaños

B) Fiesta de piscine D) Una dormida en la casa de su compañera

Muy inseguro 1——2——3——4——5——6——7 Completamente seguro

3. Además de robar el dinero, ¿qué cual otra cosa fue castigada Susan?

A) Hacer trampa en un examen C) Obtener molesto

B) Mal comportamiento D) Mintiendo

Muy inseguro 1——2——3——4——5——6——7 Completamente seguro

Story #2 (Spanish)

Mientras que Clint y sus amigos parquean en el parque de diversiones, el estaba muy nervioso y su corazón empezó a latir rápido. Después de pagando la entrada de $29.95, al fin entró en el parque y fueron rodeados por toda clase de atracciones. Los amigos de Clint le insistieron que valla a uno de los paseo con ellos, y Clint dijo que lo haría. El amigo de Clint, Tony, escogió el más rápido del parque entero para que se monten, "Montaña velocidad." Sus amigos le dijeron que no se preocupara y que sería divertido. Después en línea para el paseo, se pusieron los asientos y, tan pronto como ellos mismos se sentaron, la montaña se fue. Clint gritaba y gritaba y quería salir de la montaña, pero después de un poco, estaba disfrutando de la montaña! Tan pronto como el paseo de la montaña terminó, Clint estaba corriendo tratando de decidir qué montaña para montar después.

1. ¿Cuánto cuesta entrar en el parque de diversiones?

A) $40.95 C) $29.95

B) $25.50 D) $95.25

Muy inseguro 1———2———3———4———5——6———7 Completamente seguro

2. ¿Qué tipo de paseo le elijaron a Clint?

A) El más largo C) El más reciente

B) El más rápido D) El más cercano a la puerta

Muy inseguro 1———2———3———4———5——6———7 Completamente seguro

3. ¿Cuántas veces ha sido Clint a un parque de diversiones antes?

A) 7 C) 2

B) 0 D) 6

Muy inseguro 1———2———3———4———5——6———7 Completamente seguro

Story #3

John estaba manejando por la I-70 a Kansas City para una entrevista de trabajo que solamente viene una vez en la vida. Él había aplicado recientemente para un puesto de investigador en una empresa nueva y había recibido una llamada para una entrevista. John se aseguró de que él había salido temprano sólo para asegurarse de que iba a llegar a Kansas City a tiempo. John era alguien que esperaría hasta el último minuto para hacer algo. Sin embargo, él no iba a esperar hasta el último minuto para salir de su casa y quería ser presente para la entrevista. A mitad del camino, Juan oyó un fuerte "POP" y al instante comenzó a desviarse. John recuperó el control de su camioneta y se detuvo a un lado de la carretera y sabía que su peor temor se había hecho realidad.

1) ¿Dónde estaba la entrevista de John?

A) Kansas City C) Dodge City

B) Topeka D) Lawrence

Muy inseguro 1———2———3———4———5——6———7 Completamente seguro

2) ¿Qué puesto de trabajo vio John solicitar?

A) Profesor C) Camionero

B) Equipo de investigación D) Dentista

Muy inseguro 1———2———3———4———5——6———7 Completamente seguro

3) ¿Qué sugiere el fuerte "POP" a John?

A) Pasa algo con el motor C) Golpear a un animal

B) Se le poncho un neumático D) Algo se cayó de la camioneta

Muy inseguro 1———2———3———4———5——6———7 Completamente seguro

Story #4

Edward era algo así como un solitario. Le gustaba ir a pescar el mismo en el lago y traería una nevera llena de aperitivos para disfrutar con su perro. Un día, Edward decidió intentar la pesca de la noche y llego al lago a las 9 p.m. en lugar de su habitual 5 de la mañana. A pesar de sus mejores esfuerzos para conseguir un poco de visión, prendió sus luces de su coches detrás de él y apenas podía ver. Cuando estaba comiendo un sándwich de pavo, el oyó a su perro ladrar a su línea de pesca. Edward corrió hacia a su linia y le dio un buen tirón. No podía ver lo que estaba pasando, pero él sospechaba que era un pez grande! Finalmente en el último tirón Edward cayó hacia atrás y un cocodrilo bebé llegó arrastrándose fuera del agua con el anzuelo en la boca!

1) ¿A qué hora suele Edward ir a pescar?

A) 9 a.m. C) 11 a.m.

B) 5 p.m. D) 5 a.m.

Muy inseguro 1———2———3———4———5——6———7 Completamente seguro

2) ¿Qué tipo de sándwich comió Edward?

A) Jamón C) BLT

B) Turquía D) Bolonia

Muy inseguro 1———2———3———4———5——6———7 Completamente seguro

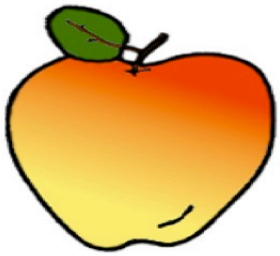
3) ¿Qué sugiero el ladrido del perro a Edward?

A) El perro se asustó C) Había algo en la línea de la pesca

B) Alguien se acercaba D) El perro estaba en el agua

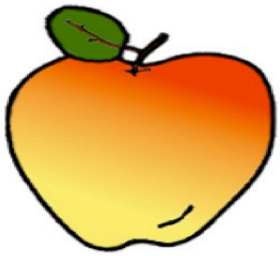
Muy inseguro 1———2———3———4———5——6———7 Completamente seguro

Appendix E - Congruent and incongruent image/word pair examples



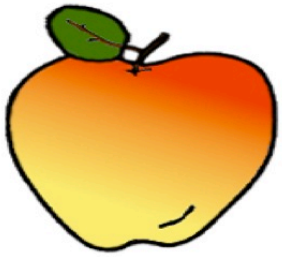
Apple

Figure E.1. **English (Congruent)**



Telephone

Figure E.2 **English (Incongruent)**



Manzana

Figure E.3 **Spanish (Congruent)**

Teléfono

Figure E.4. **Spanish (Incongruent)**

Appendix F - List of words used in MPWI task

ENGLISH	SPANISH
Anchor	Ancla
Arrow	Flecha
Axe	Hacha
Banana	Plátano
Basket	Canasta
Beetle	Escarabajo
Bird	Pájaro
Bottle	Botella
Bread	Pan
Butterfly	Mariposa
Candle	Vela
Carrot	Zanahoria
Chain	Cadena
Chisel	Cincel
Clock	Reloj
Coat	Abrigo
Cow	Vaca
Desk	Escritorio
Door	Puerta
Drum	Tambor
Elephant	Elefante
Finger	Dedo
Flute	Flauta
Fox	Zorro
Garbage Can	Cubo De La Basura
Glove	Guante
Gun	Pistola

Hanger	**Percha**
Hat	**Sombrero**
Horse	**Caballo**
House	**Casa**
Key	**Clave**
Kite	**Cometa**
Ladder	**Escalera**
Lamp	**Lampara**
Lightbulb	**Bombilla**
Moon	**Luna**
Mountain	**Montaña**
Mouse	**Ratón**
Nut	**Tuerca**
Owl	**Búho**
Peacock	**Pavo Real**
Pencil	**Lápiz**
Pig	**Cerdo**
Pliers	**Alicates**
Potato	**Patata**
Ring	**Anillo**
Ruler	**Regla**
Saw	**Serrucho**
Sheep	**Oveja**
Shoe	**Zapato**
Snail	**Caracol**
Snake	**Culebra**
Spider	**Araña**
Squirrel	**Ardilla**
Strawberry	**Frutilla**
Table	**Mesa**
Tie	**Corbata**

Toothbrush	**Cepillo De Dientes**
Turtle	**Tortuga**
Watermelon	**Sandía**
Wheel	**Rueda**
Windmill	**Molino De Viento**
Window	**Ventana**