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COGNITIVE EFFECTS OF GRAMMATICAL GENDER IN L2 SPANISH ACQUISITION: A STUDY AMONG LATTER-DAY SAINT RETURNED MISSIONARIES

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Honors Thesis

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ABSTRACT

COGNITIVE EFFECTS OF GRAMMATICAL GENDER IN L2 SPANISH ACQUISITION: A STUDY AMONG LATTER-DAY SAINT RETURNED MISSIONARIES

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Bachelor of Arts

The current study aims to explore the cognitive effects of L2 Spanish acquisition and the role that spending time in the target language country has on L2 learners' categorization of inanimate objects. Three groups of participants were analyzed: monolingual English speakers, L2 Spanish speakers that learned their Spanish while serving missions for the Church of Jesus Christ of Latter-day Saints (LDS) abroad, and L2 Spanish speakers that learned their Spanish while serving LDS missions in the United States. Using a Qualtrics survey, participants were tasked with pairing a list of adjectives stereotypically associated with males or females (Williams & Bennett, 1975) to a list of 10 control nouns (nouns referring to males and females), 10 naturally occurring nouns with feminine Spanish translations, 10 naturally occurring nouns with masculine Spanish translations, 10 artificially occurring nouns with feminine Spanish translations, and 10 artificially occurring nouns with masculine Spanish translations (Kurinski & Sera, 2011). Chi-square tests of association were run to measure the likelihood of gender-congruence (a tendency

to match the gender of the noun's Spanish translation to adjectives most commonly associated with humans of the same biological sex) within each participant group. The results added to the conversation on the Sapir-Whorf hypothesis, also known as linguistic relativity, which claims that the structure of language influences one's perception of world (Kay & Kempton, 1984). Monolingual English speaker responses were statistically more likely to exhibit a gender-congruence effect than L2 Spanish speaker responses, especially when comparing the responses to controls nouns. Additionally, there was no statistical difference in gender-congruence between the responses of L2 Spanish speakers that served their LDS mission abroad and L2 Spanish speakers that served their LDS mission in the United States. The results imply a difference in cognitive processes between monolingual English speakers and L2 Spanish speakers, but in the opposite direction that previous studies have suggested. On the other hand, the data also implies that location of L2 acquisition does not affect speakers' perception of inanimate objects due to grammatical gender.

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1. Introduction

The Sapir-Whorf hypothesis, also known as radical linguistic relativity (Kay & Kempton, 1984), is considered a highly controversial subject in the field of linguistics. The Sapir-Whorf hypothesis refers to the claim that the structure of language influences one's perception of the world; therefore, speakers of different languages experience and view the world in contrasting ways (Kay & Kempton, 1984). Since its emergence into mainstream linguistics in the twentieth century, this subject has been a popular topic of debate among linguistic scholars worldwide. It is named after American linguists Edward Sapir and his student, Benjamin Whorf. However, earlier evidence of the hypothesis has been traced back to a German polymath, Wilhelm von Humboldt, from the eighteenth century (Pütz & Verspoor, 2000).

Many empirical studies have been conducted, in a variety of languages, in order to prove or disprove the notion of linguistic relativity (Kay & Willett, 1984). These studies have involved the domain of color (e.g., Cibelli et al., 2016; Davies & Corbett, 1997; Kay & McDaniel, 1978; Regier & Kay, 2009), spatial reasoning (e.g., Calderon et al., 2019; Li & Gleitman, 2002; Tseng et al., 2016), and number marking (e.g., Athanasopoulos, 2007; Marian & Kaushanskaya, 2005; Zhang & Schmitt, 1998). The data from these studies suggest that language does, indeed, affect thought. For example, data shows that spatial reasoning is strongly affected by the use of everyday spatial lexicon in a community. However, some empirical studies also suggest otherwise (Casasanto, 2008; Chen, 2007; January & Kako, 2007), highlighting the problematic approach of identifying a causal relationship between language and thought through crosslinguistic studies as well as issues in replicating previous Whorfian studies in other

languages. As such, the question regarding linguistic relativity has recently shifted to the following: *under which circumstances* can language affect cognition?

2. Literature Review

2.1 Grammatical Gender and its Cognitive Effects

Some studies have also focused on the cognitive effects of grammatical gender; these studies suggest that the use of grammatical gender affects speakers' perception of inanimate objects (Beit-Hallahmi, 1974; Dussias et al., 2013). A language is considered to have a grammatical gender system if the gender is reflected on words other than the nouns. Spanish is considered to have a grammatical gender system because its adjectives are marked for grammatical gender (Beatty-Martinez & Dussias, 2019). For example, the Spanish word for 'beautiful' differs depending on the noun that it is describing: *la luna es bonit**a*** ('the moon is beautiful') vs. *el sol es bonit**o*** ('the sun is beautiful'). Spanish has an unequal distribution of masculine and feminine gender, with masculine gender being the unmarked or default gender. For instance, corpus studies have shown that Spanish borrowed words mostly default to the masculine gender, and large groups of people that include at least one male also default to the masculine gender: i.e., *los chicos* when referring to a group of 10 girls and only one boy (Beatty-Martinez & Dussias, 2019; De la Crus Cabanillas et al., 2007). This default has prompted linguists to study the way in which Spanish speakers process masculine and feminine articles in association with nouns.

Despite the abundance of studies on the matter, it is extremely difficult to prove that cognitive behavior is solely influenced by linguistic factors and not cultural factors. In order to disentangle the relationship between culture and language, one must single out

the specific property of language to be scrutinized and exclude additional and/or alternative cultural factors that could explain the cognitive phenomena. The latter is more complicated because most studies involve a cross-linguistic method which compares "two grossly separate groups of speakers" (Beller et al., 2015, p. 333). As such, it is expected that cultural differences will play an important role in the data, and it is difficult to determine whether cognitive distinctions arise out of linguistic differences rather than cultural differences. The same can be said when comparing speakers of languages with grammatical gender systems to those without—it is extremely difficult to prove that cognitive behavior is not influenced by cultural differences in such a case.

2.2 Cognitive Effects of Grammatical Gender in L2 Spanish Acquisition

Studying the cognitive effects of *acquiring* grammatical gender is one way to avoid such a challenge. This allows linguists and psychologists to compare participants from the same culture: monolingual speakers of a language without grammatical gender vs native speakers of the same language who also speak a second language with grammatical gender. In fact, over the past two decades, linguists have conducted experiments comparing monolingual English speakers to native English speakers that also speak a grammatically-gendered second language (e.g., Forbes et al., 2008; Kousta et al., 2008; Kurinski & Sera, 2011). These studies explore the concept of linguistic relativity, but they also avoid the issue of cultural differences among participants.

Kurinski & Sera (2011) focused on the manner in which the acquisition of Spanish in native English-speaking adults affected their categorization of inanimate objects. 50 students of beginning, university-level Spanish courses completed two tasks involving grammatical gender. The first task measured the participants' acquisition of

grammatical gender. In a classroom setting, participants were presented with images of nouns and asked to provide the Spanish words for them (including the definite articles which show gender agreement). The second task measured the participants' categorization of inanimate objects. The participants were asked to assign a male or female voice to the same images of nouns used in the first task. The nouns included eight control items (nouns with biological sex: four male and four female), and the remaining 40 nouns were divided into four groups of ten by the following categories: 1) artificially occurring feminine nouns, 2) artificially occurring masculine nouns, 3) naturally occurring feminine nouns, and 4) naturally occurring masculine nouns (where naturally occurring refers to nouns produced by the natural world, and artificially occurring refers to human-made nouns). Kurinski and Sera (2011) distinguished between naturally and artificially occurring nouns because of a study by Sera et al. (1994), which found that monolingual English speakers were more likely to classify natural objects as feminine and artificial objects as masculine. The control items ensured that the participants actually matched male voices to males and female voices to females. Finally, the participants completed both tasks four times throughout the academic year. The data showed that change occurred after just ten weeks of Spanish instruction. As participants' understanding of grammatical gender increased, they were more likely to assign male voices to masculine nouns and female voices to feminine nouns. Specifically, participants most often matched the male voice to artificially occurring masculine objects and the female voice to naturally occurring feminine objects. While Kurinski & Sera's (2011) study suggested that acquiring Spanish as a second language impacted participants' categorization of inanimate objects, it is important to note previous studies that found a

tendency in monolingual English speakers to classify artificially occurring objects as masculine and naturally occurring objects as feminine (Sera et al. 1994).

A similar study sought to explore the cognitive effects of acquiring grammatical gender by comparing English monolinguals to native English speakers who spoke Spanish as a second language. Kaushanskaya & Smith (2016) assembled a list of 22 English nouns, 11 of which had masculine Spanish translations and 11 of which had feminine Spanish translations. The nouns were matched with proper names, taking note to avoid phonological similarities. The proper names were previously proven to be statistically considered either male or female names, and the pairings were then divided into two groups: 1) gender-congruent pairs (the Spanish translation's gender matching the biological sex of the referent) and 2) gender-incongruent pairs (the Spanish translation's gender not matching the biological sex of the referent). English monolinguals, low Spanish-exposure bilinguals, and high Spanish-exposure bilinguals were presented with the pairings in random order and subsequently tasked with recalling the names matched with each noun. Additionally, a small control group of native Spanish speakers was tested to ensure that the procedure would actually bring about the predicted grammatical gender effects, and "the data from this group showed a congruency effect, with gender-congruent proper names retrieved more successfully at testing" (p. 35). Kaushanskaya & Smith (2016) then averaged the correctly-recalled gender-congruent proper names vs the correctly-recalled gender-incongruent proper names, using paired-samples t-tests to compare the three groups' performance in accurately recalling the gender-congruent vs. gender-incongruent condition. The tests revealed that the English monolinguals and low Spanish-exposure bilinguals were equally accurate at recalling the gender-congruent

proper names as the gender-incongruent proper names. However, the high Spanish-exposure bilinguals experienced a significant gender-congruency effect, retrieving the gender-congruent proper names more accurately than the gender-incongruent names. Such results suggested that higher exposure to second language learning can have significant cognitive effects.

3. Research Questions

The studies mentioned above sparked the research questions explored throughout this paper, which are as follows:

I. Is there a difference between the way monolingual English speakers and L2 Spanish speakers categorize inanimate objects, and is there a relationship between their perception of inanimate objects and grammatical gender?

II. If there is a difference between the two groups, how does spending time abroad contribute to those changes?

The ultimate goal of this research was to collect data that would allow for comparison between English monolingual and L2 Spanish speakers' categorization of inanimate objects, either supporting or refuting the notion of linguistic relativity. Additionally, I hoped to potentially shed light on the difference in cognitive effects between L2 Spanish speakers who have lived abroad and those who have not.

While similar experiments have been conducted previously, this study is unique in three ways: 1) I tried to control for extralinguistic factors by only recruiting participants born in the United States who came from the same religion (an important factor in culture, especially in LDS culture), 2) I compared participants who learned their Spanish while living abroad (in a Spanish-speaking country) vs participants who speak Spanish at

a similar level, but never lived abroad, and 3) participants were presented with a list of adjectives, retrieved from a study on sex roles (Williams & Bennett 1975), that were either exclusively associated with males or females. This allowed us to avoid semantic analysis, which can be context-driven.

4. Methodology

4.1 Participants

I recruited students from two courses taught at Brigham Young University: SPAN 321 (Third Year Reading, Grammar, and Culture) and WRTG 150 (Writing and Rhetoric) with the assistance of the course professors. Six Visa gift cards of $50 were offered as incentive for participation, acting as important recruitment tools. These courses were chosen because the university recommends SPAN 321 as the first class for LDS returned missionaries who studied Spanish during their service. More specifically, the university's Spanish department suggests that students who register for SPAN 321 can speak, write, read, and listen at an Advanced Low level, according to the ACTFL Oral Proficiency Interview scale (ACTFL). In order to further measure Spanish language proficiency, participants self-evaluated their language abilities as a part of the survey questions using the Oral Proficiency Interview scale. In addition, participants reported whether or not they served an LDS mission and if they served abroad or in the United States.

In total, I analyzed the responses of 150 participants: 52 monolingual English speakers, 53 L2 Spanish speakers who served their full LDS mission abroad, and 45 L2 Spanish speakers who did not serve their full mission abroad. Of the 45 L2 Spanish speakers that did not serve their full mission abroad, 27 served their entire mission in the United States whereas 18 spent some of their service abroad and some in the United

States. Due to an error in the survey design, gender and age was not collected for the 52 monolingual English speakers. However, based on the responses from the two subgroups of L2 Spanish speakers, I inferred that most (if not all) participants fell within the age range of 18-24 years old because all but one of the 98 L2 Spanish speakers reported this age range. Of the 53 L2 Spanish speakers that served their entire missions abroad, 36 were male and 17 were female. Of the 45 L2 Spanish speakers that did not serve their entire missions abroad, 15 were male and 30 were female. All 150 participants were members of the Church of Jesus Christ of Latter-day Saints. For ease of purpose and clarity, the three groups described above will henceforth be referred to as mono-Eng (monolingual English speakers), L2 Spanish (all L2 Spanish speakers), L2 Spanish Abroad (L2 Spanish speakers that learned their Spanish while serving an LDS mission abroad), and L2 Spanish US (L2 Spanish speakers that learned their Spanish while serving an LDS mission in the United States).

4.2 Survey Methodology

Using a similar approach to Kurinski & Sera (2011), I created a Qualtrics survey in which participants were tasked with pairing a list of adjectives typically associated with males or females (see Table 1) with a list of 10 control nouns, 10 naturally occurring feminine nouns, 10 naturally occurring masculine nouns, 10 artificially occurring feminine nouns, and 10 artificially occurring masculine nouns (see Table 2). Rather than using semantic analysis to determine adjectives most commonly associated with males or females, I used an adjective list from a study conducted by Williams & Bennett (1975). Williams & Bennett's (1975) study presented participants (50 male and 50 female Euro-American college students) with a list of 300 adjectives commonly used to describe

people. The participants were asked to select whether each adjective was more regularly associated with men or women. The adjectives listed in Table 1 were described by at least ¾ of the participants as typically associated with either males or females. The survey was conducted entirely in English for all groups.

In the survey, adjectives were presented in pairs of four per question in a random order: two male-associated adjectives and two female-associated adjectives. Instead of asking participants to match the nouns with a gendered voice, the survey asked them to select an adjective that they felt most adequately described the nouns listed in Table 2, as mentioned previously. More specifically, participants were told the following:

Figure 1. *Survey Explanation*

We are working to write a children's story in which the following nouns will act as characters. Some of them are inanimate and will come to life in the story.

Please match each noun with an adjective that you feel best represents the noun, if it were to be used as one of the characters in the story.

The list of nouns was inspired by, but not identical to, Kurinski & Sera's (2011) list (see Appendix 1 for original) and were split into two equal lists. One half of the respondents received the first list of nouns, and the second half received the second list of nouns; both lists contained an equal number of nouns from each category and we presented in a random order. I separated the nouns into two lists in order to reduce the number of overall questions that each participant was asked, therefore reducing the survey response time.

Table 1. *Adjectives List* (Williams & Bennett, 1975)

Male-associated Adjectives		Female-associated Adjective	
adventurous	*independent*	*affected*	*high-strung*
aggressive	*jolly*	*appreciative*	*meek*
ambitious	*logical*	*attractive*	*mild*
assertive	*loud*	*attractive*	*nagging*
autocratic	*masculine*	*charming*	*prudish*
boastful	*rational*	*dependent*	*rattlebrained*
coarse	*realistic*	*dreamy*	*sensitive*
confident	*robust*	*emotional*	*sentimental*
courageous	*self-confident*	*excitable*	*soft-hearted*
cruel	*severe*	*feminine*	*sophisticated*
daring	*stable*	*fickle*	*submissive*
disorderly	*steady*	*flirtatious*	*talkative*
dominant	*stern*	*frivolous*	*unexcitable*
enterprising	*strong*	*fussy*	*weak*
forceful	*tough*	*gentle*	*whiny*
handsome			

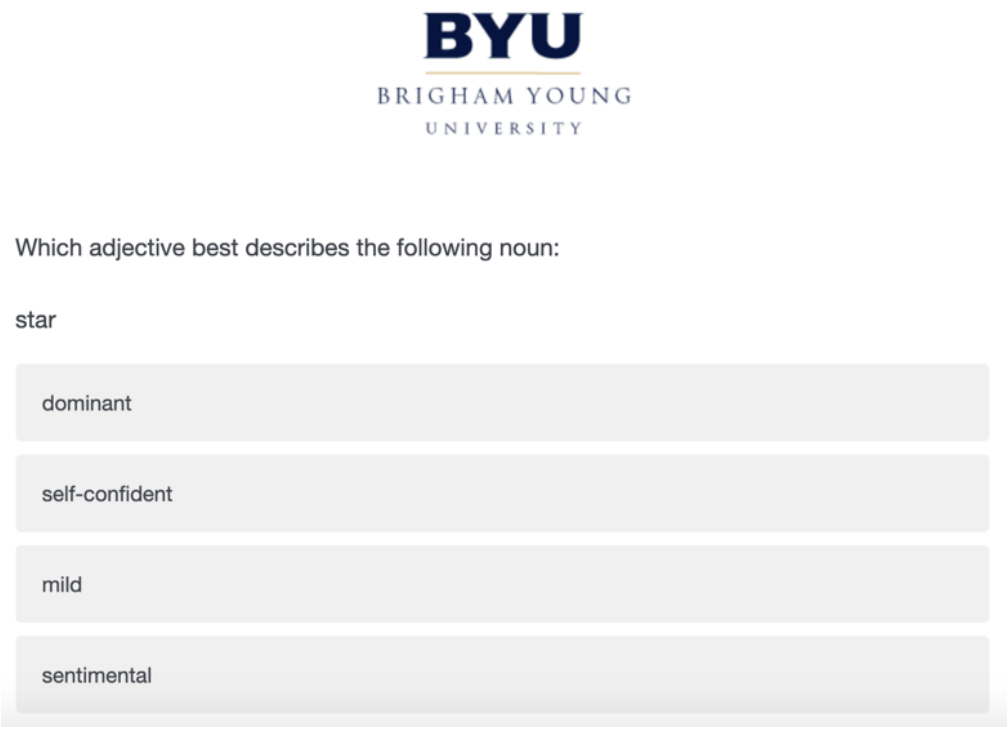
Table 2. *Nouns List*

Control Nouns			
Feminine		Masculine	
woman – *la mujer*		man – *el hombre*	
girl – *la chica*		boy – *el chico*	
mother – *la madre*		father – *el padre*	
grandma – *la abuela*		grandpa – *el abuelo*	
sister – *la hermana*		brother – *el hermano*	
Artificially Occurring Nouns		**Naturally Occurring Nouns**	
Feminine	Masculine	Feminine	Masculine
chair – *la silla*	piano – *el piano*	moon – *la luna*	sun – *el sol*
guitar – *la guitarra*	train – *el tren*	flower – *la flor*	sea – *el mar*
house – *la casa*	car – *el carro*	mountain – *la montaña*	wind – *el viento*
bicycle – *la bicicleta*	ship – *el barco*	star – *la estrella*	universe – el universo
school – *la escuela*	airplane – *el avión*	earth – *la tierra*	tree – *el árbol*
camera – *la cámara*	shoe – *el zapáto*	sand – *la arena*	fire – *el fuego*
shirt – *la camisa*	plate – *el plato*	wood – *la madera*	forest – *el bosque*
bed – *la cama*	building – *el edificio*	fruit – *la fruta*	planet – *el planeta*
church – *la iglesia*	book – *el libro*	waterfall – *la cascada*	lake – *el lago*
cup – *la taza*	stoplight – *el semáforo*	stone – *la piedra*	air – *el aire*

As a part of the survey, participants consented to participate, answered a series of basic demographic questions, and the L2 Spanish speakers reported or self-rated their language abilities (as previously mentioned). The survey lasted approximately 8-12

minutes, and it contained 25 experiential questions modeled after the sample question in Figure 2 below:

Figure 2. *Survey Sample Question*



After carefully coding the data from the survey responses, I used a chi-squared test of independence to analyze the difference between monolingual English speakers' responses and L2 Spanish speakers' responses. I then used the same test to analyze the difference between L2 Spanish speakers who learned Spanish while serving abroad vs L2 Spanish speakers who learned their Spanish in the US. Specifically, I measured the difference in gender-congruence effects (a tendency to match the gender of the noun's Spanish translation to adjectives most commonly associated with the same biological sex) in the responses between each group. All statistical tests were run using Jamovi (The jamovi project, 2020; R Core Team, 2019).

4.3 Limitations

Several flaws were discovered in the survey methodology after it had already been distributed. First, the survey only asked for the basic demographics (gender and age) of L2 Spanish and not mono-Eng speakers. Because of this, we did not run statistical analyses using age or gender as variables. We also failed to collect other demographics that play an important role in culture, due to the assumption that BYU students are cultural homogeneous: race, ethnicity, socioeconomic status, sexual orientation, etc. Second, several L2 Spanish speakers that reported serving both abroad *and* in the US (likely due to the COVID-19 pandemic) were not asked how much time was spent in each country. This created difficulties in coding the data, and some responses were not counted as a result. Finally, the adjectives list I used came from an outdated study (Williams & Bennet, 1975). Unfortunately, I was not able to find a similar list from a more recent study, which could have made a difference, especially given the fact that gender roles and associations have shifted greatly in the 50 years since the 1975 study. I would recommend replicating Williams & Bennett's (1975) study before distributing the survey on grammatical gender as a part of future research.

4.5 Hypothesis

I predicted that L2 Spanish speakers would experience a gender-congruence effect and that living abroad would *not* result in a significant difference between the two subgroups of Spanish speakers. Having served an LDS mission in the United States and taken SPAN 321 upon returning, I noticed no difference in language proficiency between LDS missionaries who served abroad and those who served in the US during my Spanish studies at BYU. More importantly, time spent abroad during missionary service has

proven to have little effect on cultural competence, according to literature on this topic (Dewey & Clifford, 2012; Lucero, 2019).

5. Results

In this section, I start by reporting the difference between the two subgroups of L2 Spanish speakers. Next, I report the difference between mono-Eng and L2 Spanish speakers, which results were much more surprising. I only include the contingency tables of the two comparisons mentioned above, but I ran more statistical tests to consider other variables' effects: control nouns, naturally occurring nouns, artificially occurring nouns, etc.

5.1 L2 Spanish Abroad vs L2 Spanish US

As predicted, there was no difference in gender-congruence between L2 Spanish Abroad and L2 Spanish US speakers ($\chi^2(1) = 0.0125$, N = 2002, $p = 0.865$). More specifically, 57.1% of L2 Spanish Abroad responses and 56.9% of L2 Spanish US responses exhibited a gender-congruence effect (see Table 3 below), clearly demonstrating that the location of L2 Spanish acquisition did not affect cognitive processes relating to grammatical gender as tested in this study. There was also no difference in gender-congruence between these two groups when comparing the control nouns ($\chi^2(1) = 0.0381$, N = 398, $p = 0.845$), naturally occurring nouns ($\chi^2(1) = 0.2461$, N = 799, $p = 0.620$), and artificially occurring nouns ($\chi^2(1) = 0.0295$, N = 805, $p = 0.864$).

Table 3. *L2 Spanish Groups: Abroad vs US*

	Congruency Effect		
L2 Groups	no	yes	Total
Abroad	565	753	1318
US	295	389	684
Total	860	1142	2002

5.2 Mono-Eng vs L2 Spanish

When comparing the responses of mono-Eng speakers to all L2 Spanish speakers, a χ^2 test of associated yielded unexpected results. While the difference between these two groups was significantly different, it was the mono-Eng responses that were more likely to exhibit a gender-congruence effect ($\chi^2(1) = 4.57$, N = 3765, $p = 0.032$) overall. In other words, 60.9% of the mono-Eng responses and 57.4% of L2 Spanish responses exhibited a gender-congruence effect (see Table 4 below). Interestingly, there was an even bigger difference in gender-congruence between these two groups' responses when reacting to control nouns ($\chi^2(1) = 6.75$, N = 753, $p = 0.009$), with 71.9% of mono-Eng responses and 62.5% of L2 Spanish responses illustrating a gender-congruence effect for control nouns. Likewise, the difference in gender-congruence was significantly different when responding to artificially occurring nouns ($\chi^2(1) = 5.266$, N = 1503, $p = 0.022$), with 64.4% of mono-Eng responses and 58.3% of L2 Spanish responses experiencing a gender-congruence effect for artificially occurring nouns. However, the difference not was significant when responding to naturally occurring nouns ($\chi^2(1) = 0.433$, N = 1509, $p = 0.511$), with 52.1% of mono-Eng responses and 53.9% of L2 Spanish responses experiencing a gender-congruence effect for naturally occurring nouns.

Table 4. *L2 Spanish vs Monolingual English*

	Congruency Effect		
Speaker	no	yes	Total
L2 Spanish	1052	1416	2468
Monolingual English	506	791	1297
Total	1558	2207	3765

6. Discussion

As predicted, the location of L2 Spanish acquisition does not seem to affect the cognitive process of matching gendered nouns to adjectives, regardless of the type of noun in question. As such, it could be argued that LDS missionaries who serve abroad will return with similar cultural competency as LDS missionaries who do not serve abroad. In other words, location of L2 Spanish acquisition does not affect cognitive process of categorizing inanimate objects in this particular way. This supports previous literature, which argues that cultural competency does not rely on manner and location of L2 acquisition alone, but on many other factors such as "aptitude and motivation, extent and type of practice, and the nature of social interactions" (Dewey & Clifford, 2012, p. 47).

Contrary to my hypothesis, mono-Eng speaker responses were more likely to experience a gender congruency effect than L2 Spanish speaker responses. This could be interpreted as evidence of the Sapir-Whorf hypothesis, but not in the way that previous literature has reported. While there is a difference between mono-Eng and L2 Spanish speakers' categorization of inanimate objects, it appears that the presence of grammatical gender in Spanish does not cause L2 Spanish speakers to perceive inanimate objects as inherently feminine or masculine (depending on their Spanish translation). Interestingly, the study that inspired this thesis experienced opposite results: when tasked with assigning a male or female voice to masculine or feminine nouns in Spanish, participants were more likely to assign male voices to masculine nouns and female voices to feminine nouns as their understanding of grammatical gender increased. This contradiction

demonstrates, again, the complexity of the Sapir-Whorf hypothesis and the near impossibility of proving or disproving it entirely.

The most interesting results occurred in comparing mono-Eng to L2 Spanish speakers and their responses of control nouns vs naturally occurring nouns vs artificially occurring nouns. For example, mono-Eng speakers are far more likely to match nouns with biological sex (i.e., woman, man, sister, brother, etc.) to adjectives associated with the same biological sex than L2 Spanish speakers. Similarly, mono-Eng speakers are more likely to match artificially occurring nouns than L2 Spanish speakers. This suggests that L2 Spanish acquisition affects speakers' perception of nouns with biological sex in that they do not perceive them as inherently masculine or feminine as much as mono-Eng speakers do. In other words, L2 Spanish acquisition could play a role in categorization of inanimate objects, especially in regard to adjective assignment. However, it is important to consider underlying factors that were not considered as a part of this study (i.e., participants' fields of study, political ideologies, etc.) that could play a role in adjectival assignment of nouns with biological sex. Likewise, it could mean that L2 Spanish speakers are affected by the arbitrariness of grammatical gender and therefore do not experience gender-congruence when describing artificially occurring nouns.

Most pro-Whorfian linguists would likely assume that the statistical differences from this study run in the opposite direction, which suggests a bias in Whorfian studies. I would argue that the results of this study do not provide direct support of the Sapir-Whorf hypothesis, but they do suggest that L2 Spanish acquisition affects adjectival assignment of nouns, especially those with biological sex. If anything, this study suggests that

language acquisition does affect cognitive processes in relation to grammatical gender, but not always in the same way that previous literature has suggested.

7. Conclusion

Linguistic relativity is a controversial subject in the field of linguistics for good reason, and methodology and replicability greatly affects the results of experiments focused on this topic. While the current study does not prove or disprove the veracity of the Sapir-Whorf hypothesis, it does add to the conversation about the cognitive effects of second language learning. The results support a weaker version of the Sapir-Whorf hypothesis, but not in the way expected. It also highlights the flexibility of the human brain and its ability to be molded by a second language experience. Additionally, the data adds to the conversation of the effects of living abroad in the process of acquiring a second language.

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Appendix 1

Artificial		Natural	
Feminine	Masculine	Feminine	Masculine
La cocina "kitchen"	*El inodoro/baño* "toilet"	*La papa* "potato"	*El tomate* "tomato"
La mesa "table"	*El carro* "car"	*La lechuga* "lettuce"	*El océano* "ocean"
La casa "house"	*El autobús* "bus"	*La luna* "moon"	*El limón* "lemon"
La cama "bed"	*El piano* "piano"	*La montaña* "mountain"	*El arroz* "rice"
La bicicleta "bicycle"	*El libro* "book"	*La manzana* "apple"	*El parque* "park"
La oficina "office"	*El plato* "plate"	*La nariz* "nose"	*El sol* "sun"
La iglesia "church"	*El video* "video"	*La fresa* "strawberry"	*El maíz* "corn"
La guitarra "guitar"	*El avión* "airplane"	*La leche* "milk"	*El huevo* "egg"
La carta "letter"	*El teléfono* "telephone"	*La playa* "beach"	*El viento* "wind"
La ropa "clothes"	*El tren* "train"	*La oreja* "ear"	*El ojo* "eye"

Note from Kurinski, E., & Sera, M. D. (2011). Does learning Spanish grammatical gender change English-speaking adults' categorization of inanimate objects? *Bilingualism: Language and Cognition*, 14(2), 203-220. https://doi.org/10.1017/S1366728910000179