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Non-habitual Code-switching Bilinguals Listen to Switched Speech: Does Switching Direction
Effect Comprehension?

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ABSTRACT

One of the most distinctive characteristics of bilingual speech is the phenomenon known as code-switching. The inter-sentential and intra-sentential shift between both languages has commonly been observed among Spanish-English bilinguals and studied through psycholinguistic research in the past. However, most of the psycholinguistic research available on code-switching has studied switching between isolated items or has presented sentences visually, neglecting to consider that most code-switching is produced verbally and processed auditorily within full sentences. The present study focuses on comprehension when listening to code-switched speech and compared the comprehension of code-switched sentences that switch from Spanish-English bilinguals' dominant language (L1 Spanish) to their weaker language (L2 English), or vice versa. Specifically, the study examined the Relative Strength Hypothesis (Meuter & Allport, 1999) and analyzed whether participants' reaction time to detect a code-switch differed for sentences that switched from the dominant to the weaker language relative to sentences that switched from the weaker to the dominant language. By testing non-habitual code-switchers, this study extended Fernandez, Litcofsky, and Van Hell (2019) who tested habitual code-switchers, thereby exploring the Adaptive Control Hypothesis (Green and Wei, 2014). Results showed that there was a significant difference in code-switching detection times depending on the direction in which the switch occurred. For code-switches from participants L2 English to L1 Spanish, RT was longer than for the switches which occurred from L1 Spanish to L2 English. These findings support Meuter and Allport's prediction that bilinguals would take less time to react when switches occur from their dominant to weaker language and brought to

light the question of how these results would differ if the same task was conducted on a population of habitual code-switchers as well.

TABLE OF CONTENTS

LIST OF FIGURES	iii
LIST OF TABLES	iv
ACKNOWLEDGEMENTS	v
Chapter 1 Introduction	1
Current Study	5
Chapter 2 Methods	7
Participants	7
Materials	7
Cognitive Tasks	8
Language Proficiency Task	8
Procedure	9
Data Analysis	11
Chapter 3 Results	12
Language and Cognitive Tasks	12
Code-switching Detection Task	13
Chapter 4 Discussion	16
Future Directions	18
Appendix A List of Stimuli	20
BIBLIOGRAPHY	28
ACADEMIC VITA	30

LIST OF FIGURES

Figure 1. Average Code-switches Detected.....	14
Figure 2. Average Response Time (Milliseconds)	15

LIST OF TABLES

Table 1. Mean Scores on Language and Cognitive Measures (SDs are in parentheses).....	12
Table 2. English Stimuli	20

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Chapter 1

Introduction

As bilingualism continues to grow and is now seen in over half of the world's speakers, including Spanish-English bilinguals in the United States, it is a topic which is getting a lot of focus in psychological and linguistic research. A hallmark of bilingual discourse is code-switching, the use of both languages in a single utterance, for example, beginning a sentence in Spanish and later transferring to English as in "Quiero que me traigas [I want you to bring me] the water bottle". While it may seem that the switch between languages is effortful and intentional, often times it goes unnoticed by bilinguals who have become accustomed to producing and listening to code-switches in their daily lives. Although throughout the years the body of research on code-switching has grown, the research is constantly developing and adjusting to better understand why and how bilinguals code-switch.

While code-switching has been studied mostly by linguists in the past, recently it has begun to boom in the fields of neuroscience and psycholinguistics. Although bilinguals who frequently code-switch report that code-switching is natural and effortless, research has shown that producing and comprehending code-switched sentences is often more effortful than non-switched sentences (for a review, see Van Hell, Fernandez, Kootstra, Litcofsky, & Ting, 2018). For example, in their analysis of spontaneous code-switched speech in the Bangor Miami Corpus, Fricke, Kroll, and Dussias (2016) observed that in anticipation of switching languages, Spanish-English bilinguals' speech rate slows down. This signifies that while these effects may

not be conscious or noticeable to bilinguals who produce or listen to code-switched sentences, changes in processing speed associated code-switches are measurable.

Focusing on the comprehension of code-switched utterances, Beatty-Martínez and Dussias (2017) tested habitual and non-habitual code-switchers to examine how language use may affect the comprehension of specific linguistic structures. Habitual and non-habitual code-switchers read visually-presented sentences that contained common determiner-noun switches between Spanish and English (such as gender congruent switches between masculine determiner-noun pairs, e.g., 'el fork' or gender-incongruent switches with a masculine determiner, e.g., 'el spoon' where 'spoon' is feminine in Spanish) and rarely encountered determiner-noun switches (e.g., gender incongruent switches with a female determiner, e.g., 'la fork'). Habitual code-switchers were sensitive to the distinction between common and rare determiner-noun switches, whereas non-habitual code-switchers did not show sensitivity to these linguistic patterns. As this new information about the effects of code-switching develops, so does the manner in which research is conducted to better mimic code-switching in natural discourse.

As exemplified by Beatty-Martínez and Dussias' (2017) study, traditionally, most research on code-switching using psycholinguistic and neurocognitive techniques was done through reading and visual experiments, even though in natural language conditions code-switching is much more common in speaking than in writing. While there is some research involving auditory detection of code-switches, often times this research has been done with single utterance switches, such as naming a series of unrelated pictures in different languages. Fernandez, Litcofsky, and Van Hell (2019) conducted one of the first neurocognitive studies which focused on code-switching within standard code-switching circumstances, meaning their

research focused on how participants reacted to hearing code-switches within a sentence, rather than detecting single word switches or code-switches within a visual text.

Most research on code-switched sentences studied the production or comprehension of intra-sentential code-switches (switching within an utterance, often a sentence) rather than inter-sentential code-switches (switching between sentences). In natural discourse, intra-sentential code-switches are also more common. The switches can occur in either direction: starting in L2 and switching to L1 or starting in L1 and switching to L2. Fernandez et al. (2019) studied intra-sentential code-switching in two directions, and I will study the same type of code-switches in my study.

While code-switching can characterize the speech of bilinguals with differing levels of proficiency and language use, it is important for code-switch research to identify participants as either habitual or non-habitual code-switchers. A habitual code-switcher is somebody who is highly proficient in both languages they speak and often times interchanges between the two during a conversation, sometimes without noticing. A non-habitual code-switcher is a bilingual who may also be proficient in their two languages but who does not regularly switch between both languages. Differences in the frequency with which habitual and non-habitual code-switchers produce and perceive code-switched sentences may affect their processing of code-switched utterances and how they cognitively control their language systems, which is a critical starting point in Green and Wei's (2014) Adaptive Control hypothesis. Their Adaptive Control hypothesis states that non-habitual code-switchers engage in competitive control because although they can use both languages, they tend to only use one language at a time, depending on the context of language use. Competitive control is where output from only one language (in a dual-language context) is allowed. This means that if there was interference from another

language, it would cause a greater cost in comprehension accuracy and switching time. In contrast, habitual code-switchers engage coupled cooperative control since they frequently code-switch in their daily lives. Coupled cooperative control is where language outputs are integrated from both languages as necessary. This would lead to less effortful switches for the habitual code-switchers because of the easy access to both languages. The predictions of the Adaptive Control hypothesis for the detection of a code-switch in a sentence, and differences between habitual and non-habitual code-switchers in their ease of detecting a switch, is less clear. If the competitive control mechanism of non-habitual code-switchers makes it more difficult for them to process code-switched sentences, they may take longer, and be less accurate, in detecting a switch in switched sentences than habitual code-switchers. However, if coupled cooperative control makes it easier for habitual code-switchers to access both languages, it may actually be harder for them to detect a code-switch in a sentence as the switch will go unnoticed; if so, habitual code-switchers may be slower and less accurate in detecting a switch than non-habitual code-switchers.

Apart from the differing amounts of effort it may take bilinguals to produce or perceive a code-switch based on whether they are habitual or non-habitual switchers, the direction of the code-switch has also been found to play a role in comprehension. This difference in processing cost depending on switching direction is called an asymmetrical switching cost, and has been theoretically explained in different ways. Meuter and Allport (1999) proposed the Relative Strength hypothesis which claims that even if the bilinguals' languages are nearly the same level of proficiency, and therefore should have almost no switching cost, the cost we do see will be more evident when the switch occurs from the second language (L2) to the native language (L1) than vice versa. Philipp, Gade, and Koch (2007) and Verhoef, Roelofs, and Chwilla (2009)

suggest that this cost is due to the fact that it is more effortful for bilinguals to inhibit their dominant language L1, therefore when the switch occurs from the weaker language L2 to the stronger language L1, it takes more time to release inhibition for L1 than for L2, resulting in larger switching costs when switching into L1 relative to switching into L2, as explained in Litcofsky and Van Hell (2017). Most of the above-mentioned studies tested habitual code-switchers, bilinguals who regularly switch between languages during speech and who often listen to code-switched speech. Following the results seen in Fernandez et. al (2019) which indicated this asymmetrical switching cost between habitual code-switching balanced bilinguals to be true as well, a next question to ask is, to what extent do these findings also apply to non-habitual code-switchers, such as the Spanish-English bilinguals living in Spain, identified as such in Beatty-Martínez and Dussias (2017), which is a key question in my honor's thesis research.

Current Study

In response to the lack of auditory studies on code-switching, the present study aimed to study code-switching in a more natural setting. This was done by focusing on the reaction time for detecting a switch in a sentence while listening to the utterance rather than reading it, or focusing on single word switches. One question this study addresses is whether there are any differences in noticing switches from participants' dominant to weaker language than vice versa. A second question is whether we would see differences in switch detection times between non-habitual and habitual code-switchers. This study builds on Fernandez, Litcofsky, and Van Hell's (2019) study, conducted at the Pennsylvania State University campus testing highly proficient Spanish-English bilinguals who were habitual code-switchers. Using the same sentences as in

Fernandez et. al (2019), this study will examine switch detection in highly proficient Spanish-English bilinguals who are non-habitual code-switchers. Based on the Relative Strength Hypothesis, I predicted that it would take participants longer to detect a code-switch when the code-switch occurred from English to Spanish (so from L2 to L1) rather than from Spanish to English (so from L1 to L2).

Chapter 2

Methods

Participants

Twenty-eight Spanish-English bilinguals, 11 males and 17 females, were tested for this study. All were native Spanish speakers with high proficiency in their L2, English, and self-reported non-habitual L2 use and code-switching in their daily lives. Their proficiency in both languages was measured through multiple language proficiency tasks: lexical decision task, verbal fluency task, and the Melicet, along with self-reported proficiency estimates in a language background questionnaire. Participants were recruited in Granada, Spain, via flyers placed around the city and online along and through word-of-mouth. They were compensated with \$10 an hour, averaging 2.5 hours to complete the tasks. All participants signed a written consent form before participation and were given a copy explaining the experiment.

Materials

The materials consisted of 160 sentences previously used in Fernandez et al. (2019). There were four sentence conditions: 40 sentences that switched from Spanish (L1) to English (L2) (e.g., Necesito que me traigas [I need you to bring me] the bread), 40 sentences that switched from English (L2) to Spanish (L1), 40 all English sentences, and 40 all Spanish sentences. These sentences were presented randomly in four blocks, with self-paced breaks in between for the participant to rest.

The sentences varied in length so as to be more natural and code-switched nouns appeared only once in the materials. Forty sentences were followed by comprehension questions, at random, to keep participants engaged and paying attention to the utterances. Before the start of the experiment, participants were presented 12 practice sentences to assure they understood the task instructions.

Cognitive Tasks

Participants completed the AX-CPT task (Cohen et al., 1999) and the Operation Span task (Turner & Engle, 1989) to measure cognitive control abilities and working memory capacity, respectively. The AX-CPT task presents a sequence of individual letters, categorized into groups of 5 which are divided by the first and last letter of each group being presented in red. The participant is instructed to respond to the presented stimulus by either pressing one button or another. Which button the participant presses is dependent on which stimulus is shown, most importantly focusing on the first letter being A and the last being X. The Operation Span Task presents the participant with a series of math equations which they had to quickly decide were correct or incorrect. Between these equations there were Spanish words presented swiftly as well which they were asked to memorize. They were presented with between 2 and 6 equations and words and were asked at the end of one cluster to write all the words which they could recall.

Language Proficiency Task

The language proficiency was measured by a combination of self-rated language proficiency in the language history questionnaire, along with three proficiency tasks: a verbal

fluency task, a lexical decision task, and the Melicet. In the verbal fluency task participants named objects within categories including body parts, colors, instruments and vegetables in L1 Spanish and fruits, furniture, clothing, and animals in L2 English. In the lexical decision task they were presented with letter strings and they had to decide whether this was an English word or not by pushing one of two buttons, this was also done in the same manner with Spanish words; accuracy and reaction times to real words were recorded. The Melicet consists of two English sections which focus on measuring comprehension and production abilities of participants in their L2. Participants are asked to read sentences and choose which answer is grammatically correct for the response sentence in the first section. In the second segment participants were instructed to read a passage and fill in the blanks which were most accurate for grammar and meaning. These tasks are similar to the ones used by Fernandez et al. (2019), and Litcofsky and Van Hell (2017).

Procedure

Participants arrived to the lab and were tested in a private room which only contained a table, chair, laptop, and recorder. Prior to entering the room, they sat down with the experimenter to read over the consent form. After full comprehension of the study and signing the consent form, participants were led to the room to begin the tasks. Completion of the entire experiment lasted on average between 2 and 2.5 hours and participants were compensated for their time at the end.

Upon entering the room, participants were presented with the Language History Questionnaire which asked questions about their code-switching habits and self-rated language

fluency. Following the questionnaire, they completed the code-switching task and the cognitive and language proficiency tasks which were previously used in Fernandez et. al. After each task was complete, the participant would notify the researcher and they would enter the room to switch to the next task. Participants were allowed to take a self-timed break between tasks which usually lasted 2-3 minutes. Prior to each task the researcher would read the instructions presented, in English, aloud while the participant read them on the screen. Before each task, there were also practice trials to assure that participants fully understood the task instructions.

During the code-switching task, participants were presented 160 sentences, identical to those used in Fernandez et al. (2019). Participants completed the sentence listening task while seated in front of a computer in a private room with no distractions. They were instructed to listen to the sentences, presented through headphones, and indicate by pressing the “space bar” on the computer the moment they heard a code-switch. They were told to press no matter which direction the code-switch occurred in, Spanish to English or English to Spanish and to be accurate but quick. Participants were instructed that it was also important to listen to the sentences for their meaning because there would be comprehension questions randomly throughout the task. Three seconds after the button press or after the sentence finished, the task would move on to the next sentence if there was no comprehension question. The breaks between sentences were controlled by the task, however, breaks between the 4 blocks in the task were self-paced and participants were allowed to rest if necessary.

Following the completion of the main code-switching task, participants completed the cognitive and language proficiency tasks. This included AX-CPT, Operation Span task, Verbal Fluency tasks in both languages, Lexical Decision tasks in both languages, and Melicet. Once participants were finished with the entire experiment, they were debriefed and allowed to ask any

questions they had about the experiment. They were also given cash compensation for their time and were asked to fill out a payment receipt before leaving.

Data Analysis

Data from one participant was excluded due to technical difficulties. The remaining 27 participants' data were entered into the analysis. Importantly, only half of the total 160 sentences contained switches (40 in the English to Spanish switching direction and 40 in the Spanish to English switching direction). Accuracy of detecting the code-switch was determined by counting the number of times participants detected the code-switch (out of the total of 40 code-switched sentences per switching direction). A paired-samples t-test was conducted in order to identify any significant differences in accuracy between these two switching conditions.

Switch recognition times were calculated by measuring the time at which participants pressed the space bar and subtracting it from the time in which the sentence actually switched to another language. A paired-samples t-test was conducted in order to identify any significant differences in switch detection times between these two switching conditions (English to Spanish and Spanish to English).

Chapter 3

Results

Language and Cognitive Tasks

Table 1 shows the average scores of language and cognitive tasks completed by the 27 participants whose data was included. On average, participants rated themselves significantly higher in L1 Spanish speaking proficiency ($t(52)=5.15, p<.05$) and listening comprehension ($t(52)=7.39, p<.05$) than in L2 English. There was also a significantly different better performance in verbal fluency tasks ($t(52)=6.80, p<.05$) in the dominant language as well. These results are to be expected as they are native speakers of Spanish and highly proficient in English. In the cognitive tasks, participants performed at high enough levels to meet the criteria necessary to have valid data for the analysis of the primary research study.

Table 1. Mean Scores on Language and Cognitive Measures (SDs are in parentheses)

<u>Language Measures</u>	<u>English</u>	<u>Spanish</u>
Self-rated Speaking Proficiency (out of 10)	7.39 (1.3)	9.36 (1.5)
Self-rated Listening Comprehension (out of 10)	8.46 (0.9)	9.86 (0.4)
Verbal Fluency Task (% Accuracy)	38.1 (9.2)	52.7 (6.3)

MELICET (out of 50) 35.1 (7.4)

Cognitive Measures

O-Span (out of 60) 37.1 (7.1)

AX-CPT (%Accuracy)

AX-trials 89.5 (8.3)

AY-trials 70.3 (22.4)

BX-trials 82.2 (21.2)

BY-trials 93.3.5 (10.0)

Code-switching Detection Task

Accuracy. Participants were highly accurate in detecting switches in both directions. From English (L2) to Spanish (L1), they detected an average of 34.81 ($SD=1.57$) switches of the total 40. In the Spanish (L1) to English (L2) switching direction, they detected an average of 35.27 ($SD=3.39$) switches of the total 40. The paired samples t-test did not reveal any significant differences in overall accuracy between switching directions ($t(52)=0.67, p >.05$).

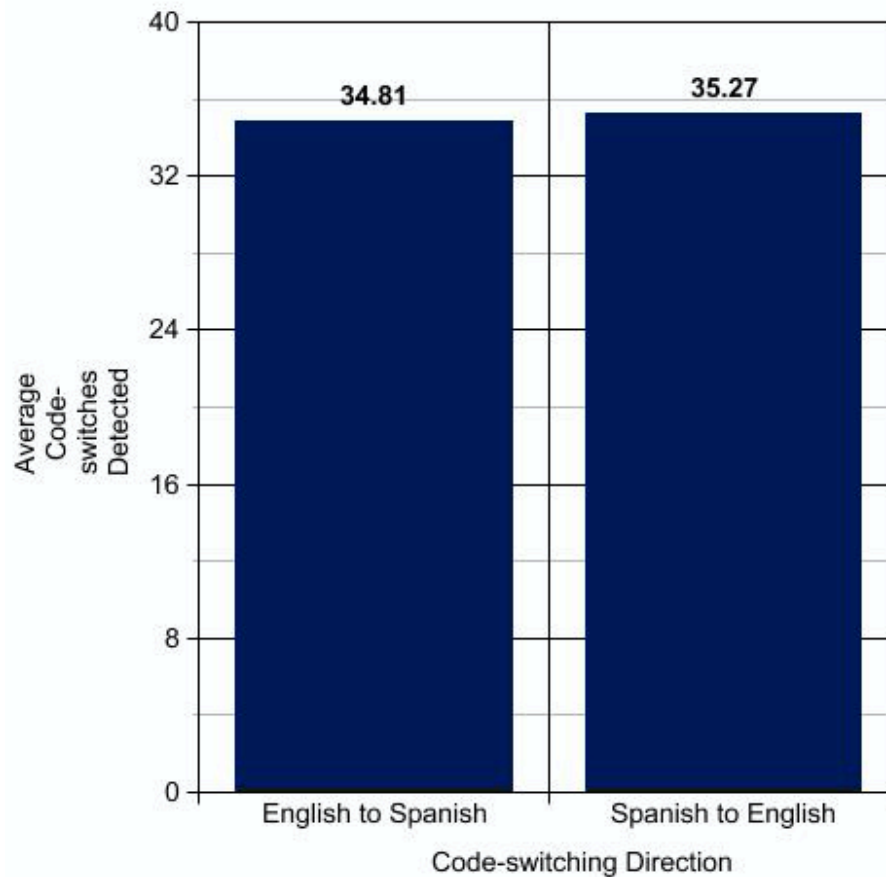


Figure 1. Average Code-switches Detected

Code-switching detection times. In the English to Spanish switching direction, participants detected a switch in an average of 311 ms ($SD=58$) after the onset of code-switched word. In the Spanish to English switching direction, they detected the switch in an average of 285 ms ($SD=68$). The paired samples t-test indicated that participants were significantly faster at detecting switches in the Spanish to English switching direction than in the English to Spanish switching direction, ($t(52)=2.14, p<.05$).

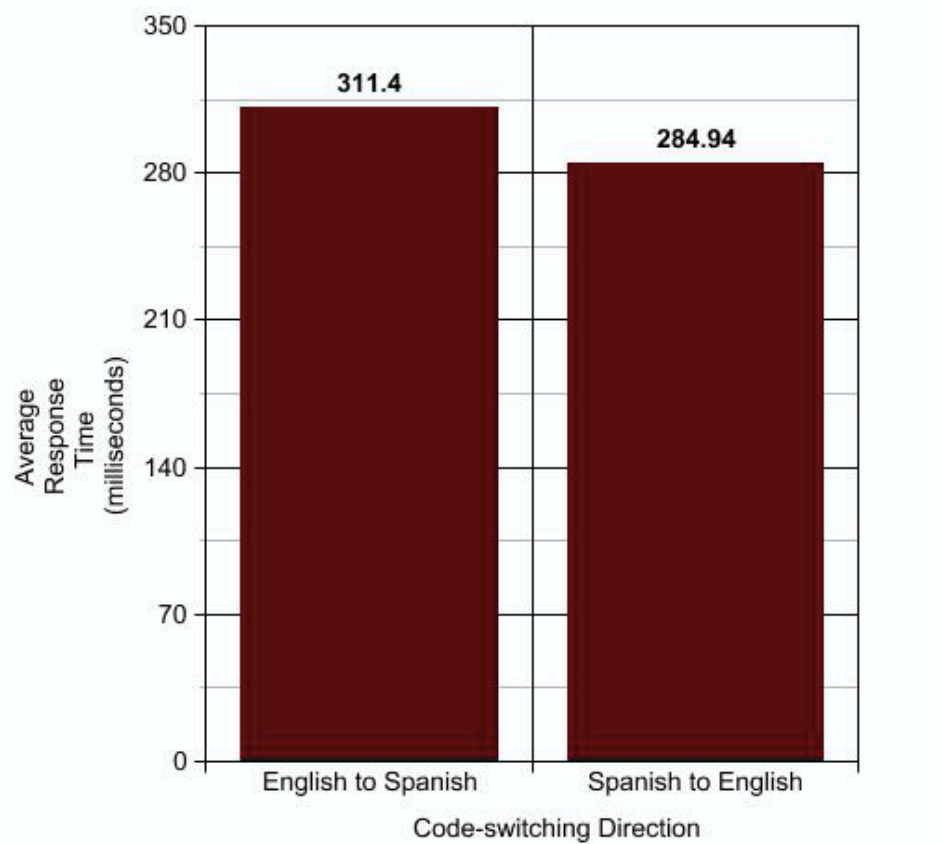


Figure 2. Average Response Time (Milliseconds)

Correlational analysis. In the correlational analysis, accuracy and reaction time data was correlated to all the language and cognitive tasks. No significant correlations were found, all $ps > .20$.

Chapter 4

Discussion

The main goal of this study was to answer the question whether bilinguals, whose dominant language was Spanish and had high proficiency in their second language, English, would take longer to notice a switch in auditorily presented sentences depending on the direction in which the switch occurred. The analysis of the code-switching task results showed that while there was no significant difference in the amount of code-switches detected depending on direction, there was a significant difference in detection time. Specifically, switches which occurred from English to Spanish took longer for participants to recognize than those which went from Spanish to English. This study thus found that, as predicted by Meuter and Allport's (1999) Relative Strength Hypothesis, it is more effortful for bilinguals to notice switches from L2 to L1 than vice versa. According to this theory, bilinguals must inhibit one language in order to use the other, whether that be the dominant or weaker language. However, the more proficient one is in a language, the more they have to work to inhibit that language. The bilinguals tested in my study were more proficient in L1 Spanish than in L2 English, so they must inhibit L1 Spanish more strongly in order to optimally perform in their L2 English. When they subsequently need to perform in the language they just inhibited, they must release the inhibition. As a result of the stronger inhibition of L1 relative to L2, the release of inhibition of L1 is more effortful than the release of inhibition of L2. So when bilinguals need to switch to processing in their dominant language it takes longer to react to L1 switches than to L2 switches.

In their review paper, Bobb and Wodniecka (2013) also support the idea that language proficiency has an impact on switching cost as previously stated by Meuter and Allport (1999), however, they suggest that there may be differing reasons for this. They bring to question the fact

that similar asymmetry is not necessarily seen if the person speaks more than two languages and if their code-switching patterns vary. Moreover, they call attention to the fact that task factors can play an important role in the observed result patterns. For example, if there is a longer delay between task activation, meaning the amount of time between intake of one code-switch and the next changes, there could be an effect on asymmetry of the code-switching cost. Along with this, because tasks vary by study and participants are code-switching in different settings, it becomes difficult to anticipate exactly which switch direction will suffer a greater cost.

Although the Fernandez et al. (2019) study was focused on observing if effects on neural patterns through listening to code-switched sentences differed based on direction of the code-switch, the greater effect was also seen when the switch occurred from the weaker to dominant language. While the data results of this study did match Fernandez et al. (2019), they do not necessarily follow results seen in other behavioral studies (e.g., Bultena, van Hell, & Dijkstra, 2015). However, these findings, once put into context, suggest that the results are compatible when taking experimental task demands and the presentation of code-switched sentences into account. The self-paced reading task conducted by Bultena et al. (2015) showed that, similar to this study, there is an asymmetrical switching costs for bilinguals when they read code-switched sentences. While their study revealed that the cost was greater when the switch occurred from L1 to L2, so different from the results in my study, the task demands in Bultena et al. (2015) are different from the present study. In Bultena et al. (2015), since the participants were reading, they had to focus on each word for comprehension rather than merely detecting a language switch as in the present study. Since it takes less time to fully comprehend a word in the dominant language, switching into the dominant language incurs less of a cost. Bultena et. al (2015) also importantly showed that there was a difference in asymmetry and the cost was larger

when the bilingual was less proficient in the L2, which supports Green and Wei's (2014) theory that non-habitual switchers would take longer to notice switches than habitual switchers and helps to explain the possible outcomes of replications of this study later on.

Future Directions

A possible direction for future research would be to conduct this identical study with a population of habitual code-switching Spanish-English bilinguals, residing in America, who's primary language is Spanish and are highly proficient in English. While Fernandez et al. (2019) did test habitual code-switchers, their study focused on ERP and TFR analysis rather than the time it takes to detect a code-switch. By running this exact experiment with habitual code-switchers, we would be able to closely analyze the effects of the Adaptive Control Hypothesis by Green and Wei (2014) on natural intake of code-switched speech. While this hypothesis states that, in reference to speech production, non-habitual code-switchers will have a greater cost when it comes to producing code-switched speech than habitual code-switchers, it would be interesting to extend these predictions to listening to code-switched speech.

With respect to the Relative Control Hypothesis by Meuter and Allport (1999) we would expect to find the same results in habitual code-switchers as observed in the non-habitual code-switchers tested in this study: detecting code-switches from the dominant L1 to weaker L2 will be less costly, and thus faster and more accurate, than vice versa. However, the predictions of the Adaptive Control hypothesis, and whether habitual or non-habitual code-switchers would experience less of a cost in overall reaction time, are less straightforward. A key assumption of this hypothesis is that habitual code-switchers have coupled-cooperative control, signifying that

output of the languages are integrated as needed, while non-habitual switchers have competitive control of their languages, where only one language is allowed at a time. For production, this theory predicts that habitual code-switchers would perform better due to this coupled-cooperative control, because they are used to mixing the languages often and therefore it is a more natural process for them. However, when asked to detect code-switches in spoken sentences, this could actually hinder habitual code-switchers: if a person is very accustomed to hearing code-switches on a regular basis, it may take them more time to notice a switch than somebody who does not often hear switches. Due to the competitive control that non-habitual code-switchers are supposed to operate under, it may actually be easier for them to distinguish the change in language because the languages do not often flow together, so they could actually notice the switch at a faster rate, in contrast to the prediction of the Adaptive Control Hypothesis.

If this study is ever conducted, it would be beneficial to ask participant candidates to fill out the language history questionnaire beforehand and analyze those results before allowing them to partake in the code-switching task. This shift in procedure could allow for a narrower selection of participants who meet the criteria, and therefore would help produce the most accurate results possible. Performing this study with habitual code-switchers could give us a better understanding of the differences and similarities between intake and output of code-switched speech effects on bilinguals and which group, habitual or non-habitual code-switchers, the switching cost effects more profoundly when listening to natural code-switched speech.

Appendix A

List of Stimuli

The stimuli below are the English sentences which were later replicated in all Spanish and code-switched sentences as well for the total of 640 sentences which were used throughout the 4 possible lists participants completed.

Table 2. English Stimuli

	This morning, a wild vulture bit a rabbit who ran past very quickly.
	After the felony, a harsh punishment was given to the thieves by the judge.
	The girl saw some nice shirts in the shop across the street from her school.
	Every Sunday, she reads a short book related to chess to improve her skills.
	A lot of brochures were handed out by the protestors before their rally.
	Next week, the young waiter will begin his job with great excitement.
	The old men got together to watch a movie about the gangs in their city.
	In its basement, the building collects hundreds of suitcases lost by the various visitors.
	The other night, the neighbors watched the fight but did not try to stop it.
	Tomorrow, Aaron and his friends will build some shields to use in a fantasy game.
	Very angrily, the businessman pounded on his keyboard to get rid of stress.
	He is best known as a writer of an assortment of stories and beautiful poetry.
	While running her errands, the consultant stopped at the news stand to pick up today's paper.
	She was on her way to a parade with a singer whom she had admired for a long time.

	Even though it was a dreary day, Ann's friendly parrot ensured a smile with the audience.
	Christina was uneasy because of the dogs spotted around the neighborhood earlier this week.
	Everyone at the party whispered about the ribbons that decorated the entire room.
	Arthur hoped that the gift would not be filled with socks and ugly ties.
	Please put the extra meat in the freezer when you are done eating.
	Yesterday, George found out that a jail will replace the warehouse that was demolished last year.
	Every morning, Sarah gets her gloves caught in the zipper of her jacket.
	Suddenly, I remembered that the woman had warned us about the storm that was coming.
	Sadly, the young winner sprained his ankle and could no longer compete in the final round.
	Last week, a truck overturned in the road and spilled many gallons of fuel.
	Staring into the sky, the dreamer thought about his hopes and dreams for the future.
	For the winter, Angela's scarf was made out of wool to keep her warm.
	This morning, the orderly brought the crutches to Anne and showed her how to use them.
	Last year, the earthquake destroyed all of the village and the surrounding areas.
	For tomorrow, bring an eraser for the quiz on physics and astronomy.
	The other night, the rooster wandered into a meadow that was very dangerous.
	Looking over the crowd, the supporter stood atop of the stairs and shouted his opposition.
	Adam wanted to pick peaches and lots of plums at the nearby farm.
	Being lazy, the boys threw stones into the pond to pass the time.
	Some people at the beach watch all the fish swimming amongst the coral.
	Once a month, referees mingle with the players before the game starts.
	Sometimes, young people enjoy eating grapes during a break from their classes.
	Elizabeth brought her granddaughter on a walk along the river.

	In the fall, some people put skulls in the windows of their houses.
	After the couple's wedding, their church was covered in posters, streamers, and balloons.
	Since Danielle was homesick, her boyfriend bought her a ticket to come visit.
	Charlie will soon be a lawyer with his own sail boat just like his father.
	At last, the squad saw the inmate as he left his house.
	Thankfully, the ignited skyscraper was saved by the firemen who are very brave.
	People say that childhood brings some of the best memories of your life.
	The woman at the tombstone bowed her head to pray in silence.
	She likes to watch the sparrows rather than the ducks that live near the reservoir.
	The stove was leaking smoke into the entire kitchen and caught on fire.
	The dust rose off of the sidewalk in lots of swirls of heat and dirt.
	Emilie and her aunt love apple dumplings served with walnuts on the side.
	Her expansive and beautiful lawn was covered with lanterns and garden gnomes.
	The king instructed that his blade be made of gold and bronze only.
	He decided to become a clergyman after the death of his grandfather.
	Even though her review was turned down by the journal, she published it independently.
	Brittney cleaned up the counter with a rag after the huge spill.
	She brought her umbrella along with her raincoat to keep her dry from the heavy rain.
	Sophia lounged around in her slippers with a cold while she was stuck at her house.
	Paul asked to see the ring in the showcase at the jewelry store.
	Roger took the overcoat to his tailor to get alterations.
	Nicholas bought some ointment for the blister on his hand.
	Luckily, Victoria had no wounds except a rash that worried the paramedics.
	Jessica will learn more about her midwife during an appointment in the next few weeks.
	She did her homework on the birth of the stars as seen from various countries.

	Filled with anger, the knight slayed the witch in the high tower.
	Out of sympathy, the traveler told the beggar where to find some help.
	They found out that the nurse liked her boss because of his generosity.
	I think that puppies are scared of vacuums because they are loud.
	From what I've noticed, wasps often hate bees with a violent passion.
	In the old days, planes had fewer seats, but had more luxuries.
	Eleanor could not believe the wickedness and sadness of the famine occurring all over the place.
	The girl set the notebook on the table with the intent of finally starting her research.
	After seeing Molly's distress from the prank, Frank regretted planning it.
	When Nathan is sick, he pours some honey into his milk to feel better.
	Scott likes playing basketball instead of fencing in order to stay in shape.
	This morning, the manager received the printer from the main office.
	Soon after arriving, the stewardess found her luggage and headed to the car.
	That morning, the lifeguards watched the wave as it hit the shore.
	Last week, Marcus hung a clock next to the mirror in his room.
	Yesterday we agreed that the striped pillows match the rug in the living room.
	Bryan will spend a week at the wharf as part of a trip with his company.
	All summer long, Chris collected spiders and other specimens to view under his new microscope.
	Luckily for me, the hair dresser can cut any hair in the latest styles.
	Feeling very tired, the baker took a nap to boost his energy.
	When night fell, the wolf howled at the moon as loudly as he could.
	I enjoy eating cinnamon with my breakfast because it is healthy.
	Having learned that beetles have so many legs and can bite, Gloria is now very scared of them.
	They could not carry the mattress through the small door of the couple's house.
	She hung her dresses on the clothes line and they all blew away.
	The cat chased the squirrel through the entire sewer until he finally caught it.

	He hoped that the pills could cure his sick horse before the show the following week.
	Madeline wrote some folktales about two doves, the symbols of peace and love.
	Tyler will only eat noodles with butter and cabbage ever since he was introduced to Polish cuisine.
	After the blizzard, helpers provided some relief for the victims.
	Kristy loves to have ferns in her home because they bring her good luck.
	Very repulsed, the shopper removed all the cashews from his salad.
	On the hill there is a nursery where the nuns honor their virtue.
	I like eating chicken with a side of fries and a milkshake.
	Tori and Jess went to a dance for the scholars visiting from Europe.
	Alexa stuffed a bunch of coins into her pocket before heading to the supermarket.
	According to Peter, no brewery will provide a meal so late at night.
	This morning, they approved the budget for this spring after many meetings.
	Early this morning, the board acknowledged their praise for the behavior of the fans during the championship game.
	Because we were not tired, we ordered cupcakes for our dessert and talked some more.
	Naively, Doug gave his stepbrother a bunch of candy that made him get very sick.
	Carol was very proud that her stuffing fit so well with the turkey and other entrees this Thanksgiving.
	The Bradley's like to buy onions and garlic from the farmer each week at the local market.
	Jack and Amanda handed out flyers for the sale very early this morning.
	Sadly, Cheryl forgot the basket for her daughter and had to meet her empty handed.
	The young parents bought a lot of pacifiers and enough clothes to last until their baby's third birthday.
	Thomas, look at the ditch next to the swings on the east end of the playground.
	Corey didn't realize he left his cooler on the pier until it was too late.

	Valerie left her wet canvas next to the easel while her young kids were running around.
	Greg put some pencils on his desk as soon as he got to class.
	He was angry because the plug for his iron was not working properly.
	She thoroughly enjoyed the snow and the landscape of the mountain range.
	The men always choose to drink water with the stew rather than wine.
	The coach emphasized that fearlessness, ruthlessness, and strength were the keys to winning.
	Tiffany wanted for herself the jewels of the kings and queens of all of Europe.
	He had been a locksmith in the county for the last five years.
	Karina learned about moles, bones, and teeth in her biology class.
	For ten years, the old lizard lived in my shed, eating mice and scaring away the other swamp creatures.
	She was taken aback by the ugliness of all the engravings in the art exhibit.
	Every year, the shop keeper makes his own toys for the young children.
	One of the clowns broke through the wall while singing and dancing.
	The teachers take the kids to the libraries and the pools to acquaint them with the local culture.
	Very little remained of the path and all the hedges after the heavy rain.
	Olivia tried to find her lost earring in the hallway of the very large hotel.
	They raced from the fence to the bleachers ten times before deciding who was faster.
	She looked at the screen next to the chalkboard and raised her hand to answer the question.
	This morning, Joel was craving eggs with some bacon or sausage on the side.
	He won't eat anything but mushrooms with those ribs and refuses to order something different.
	Heather only dares to make pork on the grill when her husband is around for damage control.

	They were not expecting the lightning or the hail storm and had to quickly run to safety.
	By learning from wars and performance in centuries past, we have improved our military strategies exponentially.
	In the fall, Michael harvests wheat and other crops to sell in the market.
	After the noise complaint, the landlord spoke to the tenant privately and gave him a severe warning.
	He likes having his livestock next to the orchard because it makes it easier to keep an eye on everything.
	She always stores the wheelbarrow under a shelf in her enormous barn.
	Sammy was displeased that the loud speaker next to the mailboxes was still broken despite many calls to the superintendent.
	The Greeks felt a great surge of achievement and pride after they defeated the Persians.
	She bought these paint brushes for the portrait that became very famous.
	The left lane of the highway is closed due to flooding for the rest of the week.
	Even though he was in pain, the handy man climbed to the roof to work from a better angle.
	Yesterday, Jennifer purchased soaps for the shower in the upstairs bathroom.
	They carefully lifted the bookcase onto the forklift and slowly drove away.
	The king rode an ostrich across the bridge into the adjacent lands.
	The loose sheets fell out of her brief case into the puddle while walking down the street.
	This year, his niece wants a helmet and skates for her birthday.
	He turned on the heater in the washroom and continued his project.
	To make matters worse, he found bed bugs in addition to the ants that were already causing problems for the homeowners.
	Phil and Jamie played with their puzzles on the quilt until it was time to watch television.

	She didn't want to leave the snacks with the twins for fear that there would be a huge mess when she returned.
	Anne was overwhelmed by the loan on her mortgage but there was nothing she could do about it.
	He walked outside to find drenched furniture near the sprinklers and his mood instantly turned sour.
	With the help of a crane, he moved boxes full of tools and building supplies.
	She bought more hairspray as well as razors since she was close to running out of both.
	Whether it's the dishwasher or the dryer, Kathy hates everything to do with cleaning.
	She fixed the ripped sleeve of the sweatshirt because she couldn't bear to part with it.
	Gabriella ended up with a bruise on her back after a rowdy night out.
	They rushed to the courthouse after the shooting that caused havoc for many people.
	He was given an award for his sportsmanship during the tournament.

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ACADEMIC VITA

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EDUCATION:

The Pennsylvania State University Schreyer Honors College,
University Park, PA
Bachelor of Arts in Psychology
Spanish Minor

August 2017- Present
Class of 2021

RESEARCH EXPERIENCE:

Center of Language Science

Penn State, University Park, PA

Undergraduate Research Assistant

August 2018 – Present

Bilingualism and Language Development Lab (*Janet van Hell, PhD*)

- Assisted in the development of an EEG study focused on the neuropsychology of cross-dialectal communication.
- Conducted EEG study on language processing in three different populations: monolingual English speakers, Chinese-Americans and Chinese-English bilingual.
- Trained in several behavioral tasks that examine cognitive control, language production and implicit bias.

NSF PIRE Fellowship, International Research Experience for the University of Granada Summer 2019, Granada, Spain

- Conducted a psychophysiological code-switching study on Spanish-English bilinguals, followed by multiple behavioral tasks.
- Recruited and tested 28 Spanish participants.
- Coded and analyzed the data collected from the experiment to present findings in honors thesis.

HONORS AND AWARDS:

Dean's List

Fall 2017-Present

President's Freshman Award

Spring 2018

- For maintaining a 4.0 both semesters freshman year

- President's Sophomore Award** Spring 2019
- For maintaining a 4.0 all 4 semesters freshman and sophomore year
- Paterno Fellows Program** Fall 2017 - Present
- Honors Program which involves taking part in honors courses, a senior thesis, studying abroad and/or doing an internship, community service commitments, and ethics course.
- Schreyer Honors Scholar** Fall 2019-Present
- Honors College Program at The Pennsylvania State University which includes requirements such as a senior thesis and mandated honors courses.
- NSF Partnership for International Research and Education (PIRE) Fellowship**
Summer 2019
- Awarded a federally funded grant to travel to Granada, Spain and independently conduct a psycholinguistic research project.

CONFERENCE PRESENTATIONS:

- Young Scholars Speaker Series 2019** Spring 2019
Poster Presenter
- Gonzalez-Recober, C., Van Hell, J., Fernandez, C., and Bajo, T. *Comprehension of Code-switched Speech: Does Code-switching Experience Play a Role*
- Young Scholar Speaker Series 2021** Spring 2021
Poster Presenter
- Gonzalez-Recober, C., Van Hell, J., Fernandez, C., and Bajo, T. *Non-habitual Code-switching Bilinguals: Does Switching Direction Effect Comprehension?*

WORK EXPERIENCE:

- Child care provider** Summer 2020
- Cared for a 5-year-old on a daily basis (created age-appropriate activities and worked to keep child mentally and physically stimulated)
- Undergraduate Teaching Assistant (Adolescent Psychology course)** Fall 2019
- In charge of running exam review sessions and helping students who have questions about the material, as well as assisting in homework and exam organization for the professor.

ABROAD EXPERIENCE:

- Spanish courses at the University of Malaga** Summer 2018
- Four week course which focused on advancing Spanish skills in grammar, speech, and culture for C1/C2 speakers.
- NSF PIRE Fellowship at the University of Granada** Summer 2019
- Two-month program during which linguistic research was conducted.

Semester abroad in Madrid, Spain

Spring 2020

- Took courses in Spanish through the IES Abroad program at the Colegio Mayor Nuestra Señora de Guadalupe

VOLUNTEER EXPERIENCE:

Nittany Greyhound Club

Spring 2018 – Fall 2020

President (Spring 2018 – Spring 2019)

- Coordinated volunteering efforts at the Nittany Greyhound dog shelter.
- Recruited students to join the club as volunteer members.
- Organized which days students would volunteer and where their efforts would be useful.

American Red Cross Blood Drives

Fall 2018- Spring 2020

Volunteer

- Assisted in checking in students who were going to donate and caring for them after their donation to assure no health issues were present.

Penn State Dance Marathon (THON)

Spring 2018 – Spring 2021

Zeta Tau Alpha Community Fundraising Chair

- Involved in the selective Alternative Fundraising Committee which focused efforts to raise money and emotionally support the Penn State Children's Hospital in Hershey, PA Four Diamonds Families who have/are suffering from pediatric cancer.
- Organized fundraising events with restaurants and other establishments within the community.

EXTRACURRICULAR ACTIVITIES:

Zeta Tau Alpha Sorority

Spring 2018 – Present

-Involved in philanthropic efforts for Breast Cancer Education and Awareness

-Involved in the alternative fundraising committee for THON

Fall 2019- Spring 2021

-Alternative Fundraising Community Fundraising Chair

Fall 2020- Spring 2021