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VOLUNTARY CODE SWITCHING COSTS AMONG SPANISH-ENGLISH BILINGUALS

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ABSTRACT

A common occurrence among multilingual speakers is the switching of languages in the course of a conversation, even within a single phrase or sentence (e.g., **Por favor, tráigame los** groceries from the garage/ Please bring me the groceries from the garage). This phenomenon is known as code switching and is a focal point for researchers looking to better understand the way multilingual speakers process language. For example, one view holds that switching back and forth between languages is an inefficient process for the brain, described as a "switch cost". While the results of these studies support the hypothesis that a switch cost exists, the researchers focused on "cued" switch costs. In doing so, the participants did not switch at will; rather, they were to switch as soon as they were constructed. Cued switching tasks are practical in that they allow for the researcher to better control switches and operationalize costs. However they present an inaccurate representation of how multilingual speakers code switch (they code switch at will, not on command).

Therefore in the present study, Puerto Rican Spanish-English bilinguals were presented with a voluntary switching task. The participants completed a scene-matching task in which they described an image for a confederate to replicate. The participants were given a two-minute time limit in order to induce a pressure scenario. Code Switching frequencies were compared between the first minute of the task and the second minute in order to determine whether or not the participant code switches less when pressed for time and communication must be more efficient. If the participant persists in code switching, however, it would suggest that any mental cost of code switching either doesn't exist or is negligible.

Keywords: code switching, bilingualism, processing costs, lexical access, Spanish

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CHAPTER 1: Introduction

What is Code Switching?

While it may be assumed that bilinguals use their acquired languages completely separately, linguistic research has found that this is rarely the case. Instead, it is common for bilinguals to utilize both languages while engaged in the same conversation or even in the midst of speaking a single utterance. This phenomenon, known as "code switching", is popular in its role as a unique manifestation of language among both communities and individuals existing under the use of multiple languages.

1. *Spanish-English*

   Sometimes I'll start a sentence in Spanish [sic] ***y termino en español***

   "… and I finish in Spanish."

   (Poplack, 1980 as cited by Bullock & Toribio, 2009, p. 2)

2. *Swahili-English*

   That's too much. ***Sina pesa***.

   "… I don't have [much] money."

   (Myers-Scotton, 1993, p. 41, as cited by Bullock and Toribio, 2009, p. 3)

3. *Dutch-Sranan*

   Wan heri ***gedeelte*** de ondro ***beheer*** fu ***gewapende machten***

   One *wholepart* COP under *control* of *armed force*

   "One whole part is under control of the armed forces"

   (Bolle, 1994, p. 75, as cited by Bullock and Toribio 2009, p. 3)

4. *Persian-Swedish*

   Xob pas ***falsk-an*** pesa-â

   Well then false-COP3PL boy-PL

   "Well then boys are false."

   (Naseh Lotfabbadi, 2002, p. 101, as cited by Bullock & Toribio, 2009, p. 3)

Early research viewed code switching as a random occurrence (Lance 1975) or as the result of an unskilled bilingual speaker's inability to maintain a conversation using only his or her second language (L_2). However, evidence has since pointed to the contrary. In fact, findings have suggested that code switching may be used not among inexperienced bilinguals; rather, among more proficient 'balanced' bilinguals (Poplack 1980). Furthermore, even among these speakers, it appears as though code switching does not occur randomly in speech. Rather, researchers tend to agree that code switches adhere to certain guidelines (Poplack 1980, Pfaff 1979). Various types of code switching have been proposed to try to explain why and how bilinguals code switch.

Why Bilinguals Code Switch

A primary question surrounding code switching that sociolinguists have sought to answer is 'why exactly do bilinguals code switch?'. The answer to this question is naturally complex, as researchers have found numerous factors that can be organized in three general categories:

1. "Factors independent of particular speakers and particular circumstances… which affect all the speakers… in a particular community" (Bullock & Toribio, 2009, p. 98). Examples of such factors include economic influences, prestige, and power.

2. "Factors directly related to the speakers, both as individuals and as members of a variety of subgroups" (Bullock & Toribio 2009, p. 99). These are factors that manifest at an individual and social level, such as in relationships, attitudes, ideologies, self-perception and perceptions of others.
3. "Factors within the conversations where [code switching] takes place" (Bullock & Toribio, 2009, p. 99).

These different categories overlap and interact as different multilingual speakers of various ages, social circles, and communities engage in conversations of a variety of different contexts. As these factors change, so does the Code switching's role in a conversation.

Researchers also tend to examine code switching in relation to the community, where many of the influences of code switching have been found. Generally, researchers focus on a single community and how code switching manifests itself exclusively within it, while other researchers have looked to compare communities to better understand the reasoning behind code switching. McClure (1998) compared written code switching between the national language and English in Mexico, Spain and Bulgaria and the rationale for code switching reflected cultural attitudes. For example, English is prevalent in both Spain and Mexico, but attitudes toward English are more negative in the latter as it borders the United States. McClure (1998, p. 141) provides a demonstration of this perception in the following passage, in which English is used ironically and to demonstrate disdain toward American culture:

4. La hipocresía norteamericana no estriba tanto en los lamentos exagerados por la muerte de un agente de la DEA, y en la indiferencia o incluso el desprecio ante la muerte de decenas de agentes mexicanos (o,

> ***by the way,*** de miles de civiles panameños). *"*The North-American hypocrisy does not rest so much on the exaggerated laments over the death of an agent of the DEA, and on the indifference or even the scorn with respect to thee death of tens of Mexican agents (or, by the way, thousands of Panamanian civilians)."
>
> (*Proceso,* January 15, 1990; cited in Bullock & Toribio, 2009, p. 102)

In Bulgaria on the other hand, as Bullock and Toribio (2009) contrast, English is slowly becoming more present recently. Instead of being viewed negatively like in the example in Mexico, English has represented the aspiration toward Western progress as the country emerges from a past of communist rule.

Code Switching vs. Borrowing

Before code switches are broken into different types, researchers commonly look to distinguish code switching from a similar construct: "Language Borrowing". While researchers debate what makes one utterance code switching and another language borrowing, Callahan (2004) cites a set of common aspects either unique or more common among borrowing: 'Phonological adaptation', 'Quantity', 'Cultural borrowings and Nonce borrowings', and 'Pragmatic/discourse function'. As words are borrowed from one language and incorporated into the lexicon of another, a common occurrence is that of phonological adaptation. This occurs when a word is altered from one language in order to better suit the speech sounds of a second, distinct language. For example, the "z" in the word "plaza" in English is pronounced as a voiceless lingua-alveolar fricative ([z], like the 'z' in 'zipper' or the 's' in 'rose'). However, the word has undergone a phonological adaptation from the root language, Spanish, in which the spelling is the same but the z is pronounced instead as a voiced lingua-alveolar fricative ([s], like the 's' in

'castle'). A more disputed aspect of code switching surrounds whether a single word classifies as a code switch or an example of language borrowing. In considering quantity, Callahan (2004) distinguishes between words that share other qualities of borrowed words and those that are simply isolated in a sentence. In example 1, 'tortilla' is pervasive in American culture and displays phonological adaptation. Therefore, it would most likely be considered a borrowed word. However, example 2 would more likely be considered code switching because the Spanish word *sonrisa* does not share such features indicative of a borrowed word.

5. a. I like ***tortillas***.

   b. I looked at her in search of some reaction to my declaration of Honorable Intentions, but nada—not a hint—just her regular friendly ***sonrisa*** (smile).

(NEAR 319 cited in Callahan, 2004, p. 9)

Myers-Scotton (1997) describes different types of language borrowing. For one, "Cultural borrowings" are words that describe aspects of one language's culture that do not have proper corresponding words in a second language into which they are being borrowed. The following example demonstrates the use of cultural borrowing in the English-Tamil bilingual community to speak about a native dish for which there is evidently no proper English equivalent.

6. They still eat the same ***rasam caatam***

   "They still eat the same 'rice dish'"

(Sankoff, Poplack, & Vanniarajan, 1990, p. 85)

Meanwhile, "Nonce borrowings" are words that are used in a more sporadic sense; they don't occur with the frequency of other types of borrowings that are adopted into the lexicon. The

following example demonstrates nonce borrowing in an English-French sentence where the borrowed word "*rouler"* simply replaces its English equivalent ("rolling"). Furthermore, unlike in the previous English-Tamil example, the borrowed word does not represent a cultural concept that could not possibly have been expressed properly in English; one could easily just say "rolling" in place of "*rouler"*.

7. It's for ***rouler*** that.

   "It's for rolling"

(Paradis & Nicoladis, 2007, p. 284)

While some researchers believe this is an example of borrowing (Poplack & Meechan, 1995), others believe that if the word has not entered the lexicon of the second language it constitutes as a code switching (Myers-Scotton, 1988). Finally, Callahan (2004) cites Gysels (1992) who argues that the function of the change of language should help indicate whether it is a code switching or a borrowed word and not just the phonological structure. For those that do not serve a noticeable or important function in the discourse, she would argue, are less likely to be considered a code switching.

Types of Code switching

Much like with language borrowing, there are several different types of code switches and systems of categorization. One such system was proposed by Blom and Gumperz (1972) and broadly explains how and why some bilinguals code switch. In doing so, the researchers organized code switching into three types: 'Conversational Code Switching', 'Situational Code

Switching', and 'Metaphorical Code Switching'. Conversational Code switching is broadly described as the use of two languages in the course of a single speech event. Situational Code switching occurs when a multilingual speaker alternates his or her language depending on the speaker's setting. Speech remains monolingual throughout conversations in each setting; an example of this type of code switching can be seen among second generation immigrant children who may speak the national language at school and their parents' home language when at home. Lastly, Metaphorical Code switching occurs when the speaker switches languages to "evoke elements of a certain domain" (Callahan, 2004, p. 17). For example, immigrants may switch to their home country's language when speaking about concepts unique to their home country. Another broad distinction in the code switching literature is the differentiation between code switching at the intersentential and intrasentential levels. Intersentential code switching involves the speaker alternating languages between a pair of monolingual sentences. For example, a speaker may verbalize an entire sentence in Spanish and then speak the following sentence exclusively in English (see example 2). Intrasentential code switching describes the act of a speaker changing languages within the same sentence (example 3).

8. *Voy a ir al supermercado esta tarde*. Would you like me to get you something while I'm there?

   "I am going to go to the supermarket this afternoon. Would you like me to get you something while I'm there?"

9. *Ya no hay pan* in the pantry.

   "There isn't any more bread in the pantry"

Constraints Within Code Switching

Intrasentential code switching is of particular significance because it is at this level that researchers are interested in understanding how bilinguals code switch from a grammatical standpoint; at what parts of sentences bilinguals commonly code switch and at what points is code switching rare (Dussias, 2003). Considering the variety of languages and communities that engage in code switching it would be practically impossible to establish universal rules for code switching (Poplack, 1980). However, researchers have focused on specific communities in order to better understand their individual code switching characteristics. For example Poplack developed code switching constraints consistent in Puerto Rican and Chicano communities (1980). The two constraints described were the 'free morpheme constraint' and the 'equivalence constraint'. According to the free morpheme constraint, bilinguals in the sample rarely code switched a bound morpheme. The basis of this constraint is to stay consistent with keeping bound morphemes in tact at the morphological and syntactic level (although not at the phonological level). In example 10, -*iendo* ('-ing') is the bound morpheme and the root, 'eat', is from English. Such a code switching was not witnessed among the sample population in the study. The equivalence constraint, on the other hand, explains the tendency of code switching to follow the syntactic structure of both languages. Example 11a demonstrates an instance of a sentence follows the English rule necessitating an infinitive complementizer (*comprar* is the infinitive meaning 'to buy' in 'wants John **to** buy a new car') but not the Spanish rule requiring a subjunctive complementizer. *Comprar* was used in place of the grammatically correct subjunctive form, *compre*, as in '*quiere que John* ***compre*** *un carro nuevo'*). Meanwhile, example 11b follows grammatical rules shared by both languages.

10. Eat-*iendo*

'eating'

(Poplack, 1980, p. 586)

11. a. ***El*** man ***que*** came ***ayer*** wants john ***comprar*** a car ***Nuevo***

'The man who came yesterday wants John to buy a new car'

(Poplack, 1980, p. 587)

b. Tell Larry ***que se calle la boca***

'Tell Larry to shut his mouth'

(Poplack, 1980, p. 587)

Studying Code Switching from a Psycholinguistic Perspective

Instead of focusing on the social conditions surrounding code switching or the patterns of grammatical structure that code switching follows, psycholinguistic studies (such as the present study) have sought to explore the neurological mechanisms behind bilingual speech acquisition, production, and comprehension. Research in this field tends to set itself apart from others by focusing on direct assessments of measurable stimuli in a laboratory setting.

Experimental research can be broken down into off-line techniques and on-line techniques. Off-line techniques do not involve time-constraints; participants are not restricted on time and are able to respond and reflect on it. On-line techniques on the other hand involved timed tasks and commonly response latencies are calculated as a measure of processing difficulty. As the following sections will explain further, the present study sets itself apart from many on-line tasks of this nature in that it does not involve latencies, but timing is an important aspect.

To better understand code switching from a psycholinguistic perspective, it is important to focus on the multilingual brain. And, more specifically, how it is different from the brain of a monolingual and what parts of the brain are activated during the process of code switching. First,

in comparing multilinguals to monolinguals, research has supported physiological differences in multilingual brains such as a larger midbody of the corpus callosum (Coggins et al., 2004), higher grey matter density in the left inferior parietal cortex (Mechelli et al. 2004), and differences in neural activity (Reiterer et al. 2005a, 2005b). Behavioral differences between monolinguals and multilinguals have also been studied by Gollan and Acenas (2004) and Gollan et. al (2002, 2005): Relative to monolinguals, bilinguals are, on average, slower at naming pictures of objects, produce fewer exemplars in fluency tasks, and experience more tip-of-the-tongue moments in both their languages than do their monolingual peers (Bullock & Toribio, 2009, p. 290)

On the other hand, multilinguals performed better in nonlinguistic tasks in studies by Bialystok and Shapero (2005) and Bialystok and Martin (2004) in which participants were "identifying the alternate image in reversible figures and in ignoring irrelevant perceptual information during card-sorting" (Bullock & Toribio, 2009, p. 290). In terms of the neurological structures involved in code switching, Bullock and Toribio (2009) describe the processing locations of the L_1 and L_2 distinct, yet overlapping areas of the brain. Bilinguals then may be able to either suppress the distinct areas of one language to access the other or they may be able to keep both areas active at the same time. The focus of the present study isn't necessarily the specific neurological locations of code switching activation. However, it is important to keep in mind the theoretical concept of non-target language inhibition, which is explained in the following section.

Processing Costs in Code Switching

One area of the study of code switching involves determining whether or not in switching between a bilingual speaker's dominant language (L_1) and weaker language (L_2) the speaker

suffers a mental cost in processing the code switching. Meuter and Allport (1999) propose that truly fluent multilingual speakers are able to separate their languages in their head, although an overlap between listening in one language and speaking in another appears quite frequently. The researchers suggest this overlapping change between languages, (code switching) leads to the mental cost. More specifically, when switching from one language to another, a mental suppression of the former must take place for the retrieval and verbalization of the latter. As a matter of fact, in the process of suppression, the researchers suggest a greater cost occurs when a bilingual switcher code switches from L_2 to L_1 as opposed to switching from L_1 to L_2. As it seems counterintuitive that it would be more difficult to switch to the dominant language from the weaker one, they describe them as a "paradoxical asymmetric switching costs". They explain this phenomenon via the Task Set Inertia hypothesis stating that the preceding non-switch language has a greater effect on cost than the language reached via the switch. More specifically, the pre-switch activation of the weaker language involves active suppression of the stronger language and this process has a direct effect on the cost of disengaging that dominant language suppression. On the other hand, there is little to no suppression when the pre-switch language is dominant. The researchers presented English-Spanish Bilinguals a Numerical-Naming task in which individual digits (1 through 9) were presented one at a time on a computer monitor. When a number came up, the participant was to name the image as quickly as possible. Furthermore, each digit was superimposed over one of two background colors; the background color denoted the language the participant was to speak when naming the number. At times, the background color would change from one number to the next ("switch trials") and other times the color would stay the same ("nonswitch trials"). The response times were measured and latencies were compared between switch trials and nonswitch trials. The study's results supported the hypothesis: latencies were greater during switch trials, and switches into the L_1 were slower than switches into the L_2.

However, Gollan and Ferreira (2009) challenged the view that code switching is costly. The researchers point out that studies such as Meuter and Allport were conducted to find *cued* switching costs (costs brought about by forced switches). By the nature of the tasks used to measure costs, the previous researchers determined when the participant changed languages; the participant could not switch whenever they wanted to, therefore they were cued. Gollan and Ferreira (2009) argue that cued switching is not applicable to code switching outside of a laboratory setting because when bilingual speakers code switch they are not commanded to do so, they do so at will. Therefore the researchers studied the effects of *quasivoluntary switching*, code switching at the partial will of the speaker. They hypothesized that if a bilingual speaker code switches voluntarily (as opposed to cued switching) then they will not incur a cost. Furthermore, they also examined whether or not an asymmetric voluntary switching cost will be found as it has been commonly found in cued-switch studies. In those studies, it was found that when a bilingual switched from his weaker language (L_2) to his stronger language (L_1) there were greater costs than when the switch was from the L_1 to the L_2. Previous research pointed out the fact that this may be due to the fact that speaking in the L_2 involves active suppression of the L_1 and it is more costly to release this inhibition when switching from the L_1 to the L_2.

The researchers conducted three experiments in which Spanish-English bilingual participants were presented with a picture-naming task. The participants were given a language questionnaire and were divided into two groups: *English-Dominant* (spoke English better than Spanish n=57) and *Balanced Bilinguals* (spoke English about equal to Spanish n=16). 132 images were generated and organized at random into three lists of 44 random pictures containing 22 high frequency English names and 22 low frequency English names. The images were presented individually on a computer monitor and the participant was to name the image as quickly as possible in either English or Spanish. There were three trials in the first experiment in which the participants read one of the three lists in each trial. The participants were told to name every item

of the list as quickly as possible. In the first two trials, the participant was told to name all images in the same language (one in English and the other in Spanish) and in a third trial the participants were allowed to name the pictures at will (no restrictions were given on language naming). Afterwards, the participant was asked to translate each item into the language that was not used during the trial. In the second experiment, the researchers encouraged participants in the third trial to name words in English and Spanish each around 50 percent to test quasivoluntary language switching. Finally, the researchers ran a third experiment, identical to the first, comparing younger and older bilinguals. In this experiment the researchers expected older bilinguals to code switch as much as younger bilinguals since they predicted no cost in voluntary switching.

The researchers unexpectedly found in the first experiment that there were greater response time latencies when participants conducted the "either-language" trial as opposed to the English or Spanish trials. However, a majority of participants still chose to switch languages anyway (even though they technically did not have to) in the third trial. Furthermore, mixing increased the speed of Spanish answers but slowed down English responses. The researchers also found that during the either-language trial, the participants tended to establish a "matrix language" (a dominant language) and when switches in the non-matrix language occurred, there was a bail-out effect; participants would quickly switch back to the matrix language. In the second experiment, the researchers did not find significant switch costs when comparing the single-language trials with the either-language trial. In fact, responses were somewhat slower during the single-language trials. In the third experiment the researchers found no significant difference in naming speed between older and younger balanced bilinguals while less balanced older bilinguals switched less and slower. This showed researchers that language balance may have been a more important factor in code switching than age. Finally, the researchers recognized from the overall primary results that language accessibility may only be a partial reason for

bilinguals to code switch. However, as evidenced by the quasivoluntary experiment, it most likely does play a role in code switching even if it is in conjunction with more pragmatic reasons.

Purpose of the present study

The present study aims to examine whether or not code switching is cognitively demanding, thereby incurring processing costs. More specifically, it aims to answer the question 'Do bilinguals suffer processing costs when code switching voluntarily?'. Although past research suggests that switching between languages does in fact incur such costs during cued switching tasks (Meuter & Allport, 1999) and quasivoluntary switching tasks (Gollan & Ferreira, 2009), the current study examines purely voluntary code switching. This is because cued and quasivoluntary switching tasks do not allow the participant to code switch naturally. In these tasks the participants must switch languages when they are commanded (Meuter & Allport, 1999) or using the words provided by the task (Gollan & Ferreira, 2009). Participants had trouble switching in these tasks and it was therefore assumed that code switching was therefore inefficient. Adversely, a voluntary code-switching task would allow the participants to switch languages without restriction. Just like everyday speech, multilinguals do not code switch under restrictions; they code switch when they feel like it. Therefore it would be reasonable to assume that participants had difficulty switching languages during cued and quasivoluntary switching tasks not because code switching incurs costs, but because participants were not accustomed to switching with restrictions. If this assumption is true, then participants would have little difficulty switching during voluntary tasks and processing costs would not occur.

In this study, participants fluent in Spanish and English are presented a scene. The participant must then describe this scene while a confederate (also fluent in Spanish and English) replicates the scene using the participant's instructions. They are given a time limit of two

minutes to help the confederate replicate the scene as accurately as possible. The participant is not told when to code switch or even that they must code switch, only that they speak naturally, just as if they were talking to a friend (in fact, the confederate is a friend of the participant). Afterwards, we counted how often the participants code switches in the first minute of the task and the second minute of the task. The average first-minute and second-minute code switches among all participants were calculated and compared.

The first minute of the trial served as the control: the participant was not under any pressure to talk quickly or speak with increased efficiency, providing a baseline for how often the participant code switched casually. However, during the second minute it is expected that the participant would speak in a more efficient manner since time was running out. Therefore if code switching incurs any legitimate processing cost then participants would code switch less during the second minute. However, as stated earlier, we expect processing costs on code switching to be a result of the involuntary nature of cued and quasivoluntary switching tasks. With this in mind we predict participants to code switch during the second minute as often as they did during the first minute. Finally, it is therefore our hypothesis is that bilinguals do not suffer processing costs when they code switch voluntarily.

CHAPTER 2: Method

Participants

Ten participants were recruited for this study, all between 18 and 26 years of age (most were either 22 or 23). All participants were born and primarily raised in Puerto Rico. However, three had moved to the United States in August of 2013 and had returned to Puerto Rico for the holidays at the time of their involvement in the study. All participants spoke both Spanish and English from an early age. They were either simultaneous bilinguals (having spoken both languages since birth) or sequential bilinguals (in this instance having begun speaking English at a pre-K level). The participants all knew one of the two researchers personally. Eight of the participants were friends of one of the researchers, and two had met one of the researchers through close relation with another participant. Therefore, the researchers assessed each participant's language proficiency based on previous experience with the individual. From this assessment, the researchers determined all participants to be balanced bilinguals and all reported that they had either attained or were pursuing a bachelor's degree.

Materials

Participants were presented with a scene-matching task that was used to study the presence of code switching among bilinguals. In this task, the two researchers played one of two roles; one was the "research instructor" and the other would engage in the task as a "confederate." The participant and the confederate each sat in front of a laptop and were each presented with a series of six scenes that were displayed on their respective computer screen. The scenes were

displayed using Microsoft PowerPoint. Each scene was an individual PowerPoint slide in which moveable stock images ("objects") were superimposed over an immovable background scene. Each slide in a series had a unique background, unique objects, and a unique number of objects from the other scenes within the same series (ranging from 6-25 objects in a slide). The participant and confederate saw the same objects on the scene but arranged differently. The participant was told to give instructions to the confederate so that at the end of a pre-determined time the two scenes matched (hence the name, scene-matching task). The roles were then reversed using a different scene. Trials were timed on a Windows Surface tablet computer.

The present study examined data from the fourth slide of each series. Each of these slides included thirteen different objects (See Appendix). Each session was audio recorded in its entirety.

Procedure

The two researchers began by assigning their own roles. One (the research instructor) provided instruction and guided the task. The other acted as the confederate and completed the task with the participant. The researchers who knew the participant personally acted as the confederate; the confederate was also Puerto Rican and spoke fluent Spanish and English. The other researcher then took the role of research instructor. The participant and confederate were then told that the study looked to examine dialogues between friends. Therefore, they were encouraged to speak to each other comfortably and informally. They were told that they were welcome to speak English, Spanish, or both; language wasn't important. Other than this, there was no explicit mention of language switching and the true intention of the study was concealed. In order to promote an informal environment for the participant, the study was conducted in either the home of the participant or in the home of the confederate. This was important because it was

crucial that this task would differentiate from cued switching tasks by allowing participants to communicate and code switch comfortably, as if they weren't in a laboratory setting.

In the scene-matching task, the participant and confederate assumed the roles of "matcher" and "director". The director's scene had all of its objects in the "proper order". The matcher, on the other hand, had the same slide before them, yet the objects had been moved around within the scene so that they were not in their "proper place". The director's role was to instruct the matcher on where to move each object so that it would match the scene that the director had. The matcher, on the other hand, moved the objects as the director instructed and was allowed to ask any questions to aid in the process. For the first three slides, the participant was the matcher. Then, in the last three slides (including the relevant slide, slide 4), the participant was the director and the confederate became the matcher. As described above, the participants had to work within a time limit. Slides one and two had a time limit of 1 minute and 30 seconds, slides 3 and 4 had a time limit of 2 minutes, and slides 5 and 6 had a time limit of 2 minutes and 30 seconds.

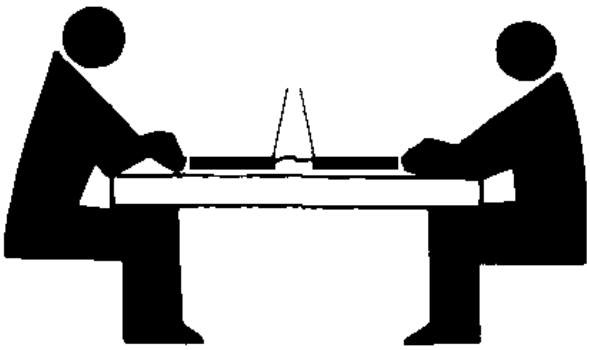


Figure 1. Setup of Scene-Matching Task

The participants could not view each other's slide and they were also not allowed to use gestures of any kind (see image above). The experimenter acted as an observer and notified the

participant and confederate that the two would run the session on their own. The experimenter then delegated the confederate the additional role of “time keeper” for the entire session. The time keeper counted down from three before each slide and started the timer for each trial. Then between trials they would reset the timer and declare when the two would switch roles. Both the confederate and the participant could see the timer at all times, and an alarm sounded at the end of the time limit. While there were no set breaks in between each slide, other than to reset the timer, participants would on occasion comment on how entertaining or challenging the game was. If the participant carried on talking, the confederate would let them continue to talk before moving to the next slide. Furthermore, the research instructor engaged in code switching when presenting the instructions. The confederate would also consistently code switched during the scene-matching task and during informal conversations with the participant in between trials.

CHAPTER 3: Results

The entire session was recorded and the fourth slide in particular was examined for the purposes of this study. This is because this was the only slide that challenged participants to the point that they were pressured to finish on time. This trial as well as its preceding and succeeding intermission periods were isolated and transcribed. A native speaker of Spanish and an English-dominant speaker who was proficient in Spanish then reviewed these transcriptions for reliability. Next, the participants' code switches were tabulated according to three different categories for both the first minute of the 2-minute time limit (0:00-1:00) and the second minute of the time limit (1:01-2:00). First, all code switches were counted, regardless of type. Second, only "intrasentential" code switches were counted. These code switches happened within an uninterrupted utterance (e.g. ***Si, basicamente*** <u>standing on the lake</u>; "Yes, basically standing on the lake"). Third, only "intersentential" code switches were counted. These occurred when a participant would finish a statement in one language, the confederate would reply or interject, and then the participant would resume talking, but in a different language than the one they left off with (see example below). The following example shows how the participant was speaking English when he or she finished the statement; then the confederate interjected. When the participant resumed speaking, they began in a new language, Spanish.

12. **Participant**: Then the white kitty is like on, in that same line on the right on top of the building.

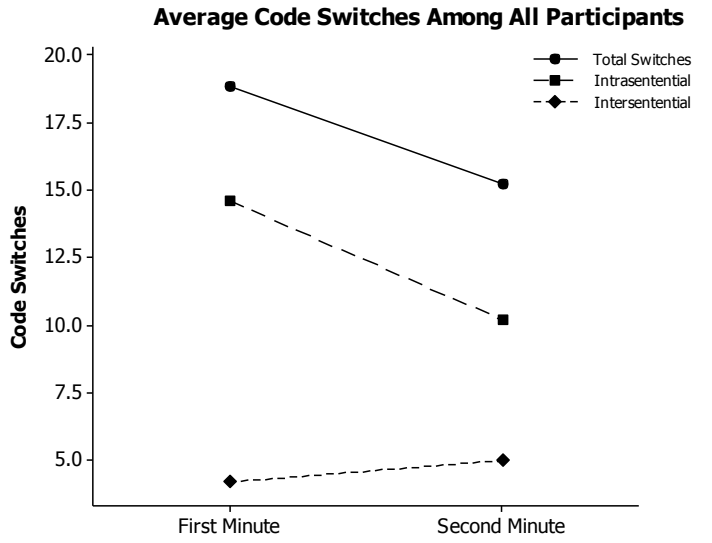
    Confederate: Skyscrapers.

    Participant: *Entonces justamente en las patitas del gatito está el libro abierto.*

Three dependent t tests were conducted. A dependent test in particular was utilized due to the fact that the same participants were examined for each variable. One was run for each unique dependent variable type: all code switches, intrasentential code switches, and intersentential code switches. The first test was conducted to compare all types of code switches in first-minute and second-minute conditions. There was no significant difference in the number of total code switches (all types) for first-minute (M=18.8, SD=7.94) and second-minute (M=15.2, SD=7.51) conditions; t(9)=2.26, p=.17. The second test was conducted to compare only intrasentential switches in first-minute and second-minute conditions. There was no significant difference in the number of intrasentential switches for first-minute (M=14.6, SD=7.88) and second-minute (M=10.2, SD=5.94) conditions; t(9)=2.26, p=.10. Lastly, a third test was conducted to compare only intersentential switches in first-minute and second-minute conditions. There was no significant difference in the number of intersentential switches for first-minute (M=4.2, SD=1.87) and second-minute (M=5, SD=2) conditions; t(9)=2.26, p=.17.

Average Code Switches Across All Participants				
	Pre-Test	First-Minute	Second-Minute	Post-Test
Intrasentential Switches	0.4	14.6	10.2	1.4
Intersentential Switches	0.6	4.2	5	1.4
All Switches	1	18.8	15.2	2.8

Table 1. Average Code Switches Across All Participants



Pearson product-moment correlation coefficients were calculated to examine associations between the six critical measures: all switches, first minute; all switches, second minute; intrasentential switches, first minute; intrasentential switches, second minute; intersentential switches, first minute; intersentential switches, second minute. The results suggested statistically significant intercorrelations for Second-Minute Intersentential Switches with First Minute Intrasentential Switches; Second-Minute Intersentential Switches with All Second-Minute Switches; Second-Minute Intrasentential Switches with All Second-Minute Switches; First-Minute Intrasentential Switches with All First-Minute Switches. In summary associations were found among all second-minute variable comparisons and only one among first-minute variables, and none between first and second-minute variables (see TABLE 2). These findings provide reason for caution in interpreting the three tests as independent of one another.

Correlation Coefficient Matrix						
Variable	All-First	All-Second	Intra-First	Intra-Second	Inter-First	Inter-Second
All-First	-					
All-Second	*0.506*	-				
Intra-First	*0.972***	*0.417*	-			
Intra-Second	*0.488*	*0.983****	*0.425*	-		
Inter-First	*0.152*	*0.392*	*-0.084*	*0.285*	-	
Inter-Second	*0.448*	*0.836***	*0.303*	*0.720**	*0.623*	-

Table 2. *p<.05, **p<.01, ***p<.001

These results confirm our expectation that the level of code switching persists among participants from the first minute to the second minute of the task regardless of the type of switch. Therefore, the results support our hypothesis: bilinguals do not suffer processing costs when they code switch voluntarily. Therefore it can be assumed that participants continue to code switch in a pressure situation thus supporting the proposed claim that code switching does not produce significant processing costs. Additionally, code switches were examined during the intermission periods before and after the trial to determine whether or not participants continued to code switch when not engaged in the task. The results found that seven of the ten participants code switched at least once between the two intermission periods. Those seven participants code switched on average 5.43 times. These findings may suggest that participants were not code switching just because they were being tested, but also during informal conversation. One final note: while these results appear to strongly support the hypothesis, it is of particular importance that the study's sample size could have affected the results. A further explanation can be found in the discussion section.

CHAPTER 4: Discussion

The aim of the present study was to examine whether or not voluntary code switching incurs a processing cost. Earlier, we explained that the evidence from previous studies supporting processing costs (Meuter & Allport, 1999; Gollan & Ferreira, 2009) is most likely the result of poor experimental design. Because code switches were cued or quasivoluntary, the participants did not have full control over switching and therefore their switches were unnatural and inefficient. Under the assumption that code switching does not in fact incur a processing cost, we hypothesized that if a task would allow bilinguals to code switch voluntarily, we would not find any processing costs of code switching. Therefore, we expected that if we put a participant in a pressure situation, then they will continue to code switch at the same rate as when they are not under pressure so long as they could switch voluntarily. The findings demonstrated statistically equivalent levels of mean code switching among participants during their first and second minute of the timed task. Therefore, the results suggest that bilinguals will code switch even when they are in a position in which speech would need to be efficient.

The present study, like most studies, has limitations with the most fundamental being its small sample size. Since the procedure involved recruiting participants who personally knew the confederate in order to elicit natural language samples, there was a limit to the number of participants possible. However, a larger number of confederates or a different confederate process could help alleviate this restriction. In the current study, it is extremely important to note that the small sample size may have altered the conclusions drawn from the results. Because the statistical power from such a small sample is low, any statistically significant differences between first-minute and second-minute code switches were very difficult to detect. Therefore any replication of this study should focus primarily on increasing the sample size for the sake of determining a

more precise effect size. Also, although the difference between first-minute and second-minute code switches was not statistically significant, seven of the ten participants switched less during the second minute of the time limit. The differences may appear minor, but it does point to a small trend and further research should be done to discover whether or not this might suggest a slight processing cost for code switching after all. Furthermore, the results of the study suggest that participants continue to code switch throughout the task, not whether it makes them more effective at completing the task. Future research in replicating or revising the scene-matching task should formulate an empirical method for scoring participants. For instance, a measure of success may be the number of objects placed correctly by the confederate. It might be concerning that a confederate is involved because the confederate knows the test and therefore where all the objects go. However, if one person works with all the participants, it would eliminate the skill level of the matcher as a confounding variable. Any replications of this study should also consider a method to better and more empirically determine how often participants in the study actually switch language in everyday conversation outside the laboratory setting. The current study recruited participants who code switched based on what the researchers knew from their relationship with the participant. While this may effectively demonstrate an understanding of the participant code switching habits, it does not provide information about how often the participant code switches. This information may be complemented with a self-report survey or a control trial in which the participant is not engaged in a task (perhaps during a role-playing exercise with the confederate or an informal interview). A Language History Questionnaire (LHQ) could also provide relevant, empirical information regarding the participants. For example, the participants could report how often they speak each language in various settings, how proficient they are in the languages, as well as exactly how long they have been fluent in the languages. This can help to get a better understanding of whether or not the participants are balanced bilinguals and if they have a favored L_1 and L_2. If this information can be established, participants' results can be analyzed on

the basis of switches into L_1 and switches into L_2 to determine whether or not asymmetric costs can be found. Through LHQs, self-report surveys, and/or control trials, researchers can get a better understanding of how often the participants code switch and how this may have an effect on how much they code switch during the trials.

There are also several inconsistencies in the procedure and setup of the task that are worth addressing. For example, two of the participants were second-degree acquaintances of the confederate (they each knew him through another confederate). This may lead to several differences among the sample. For one, these participants were less familiar with the confederate and this could have affected how comfortable they were to complete the task and perhaps code switch in a more natural way. Secondly, although the participants could see the time limit, it did not necessarily mean they were consciously aware they were running out of time. Although previous trials may have helped them to develop a "mental clock", the participants may not have recognized time was running out and therefore may not have felt as much pressure in the final minute as those who were aware. The task may have benefitted from an alarm that went off to notify the participant that there was only a minute remaining, thereby alerting them to the time constraint. Lastly, the data for this study was derived from the fourth of a series of six trials that was also used for a separate study to examine the presence of code switching. In spite of this, the first three trials coincidentally provided a proper series of practice trials for the participants to familiarize themselves with the procedure of the task. The fourth slide was the first slide in which the participant assumed the role of director. It may be more effective if the participant were able to go through at least one practice trial as the director before the "scored" trial. Ideally the fifth trial would have been the target trial and the fourth as a practice trial, but the fifth trial was far too simple to put the participants under the necessary pressure. Furthermore, this may provide the researcher with a sort of control trial in which the participant feels considerably less pressure to perform well.

As outlined in the results section, the findings support the hypothesis that code switching does not carry a significant processing cost for participants to cease switching or significantly decrease switching in a pressure situation. The significance of this study is that it tests code-switching costs in a strictly voluntary manner, when previous research of this nature utilized cued switching or quasivoluntary switching. By avoiding such tasks as numerical-naming tasks (Meuter and Allport 1999) and picture-naming tasks (Gollan and Ferreira 2009, Costa and Santesteban 2004), participants were tested on how often they could code switch at will. Furthermore, unlike in the aforementioned cued-switching tasks, participants in this study did not know they were being tested on code switching, thereby alleviating any external pressure to switch languages. It is beneficial to develop methods of testing code switching such as the one presented in this study because it is a more accurate representation of true code switching outside of a laboratory setting. This study is also of importance in that it suggests that code switching is not costly. If these findings could be replicated, ideally with a larger sample size, it would go far in challenging the notion that code switching is an anomaly in that it exists but is linguistically inefficient. If future studies are able to do this, then it will help to change the way code switching is perceived and researched. If research could further support code switching to be a linguistically beneficial process, it could change the way we understand various facets of language and bilingualism. For example, it could promote further evidence into code switching and how it pertains to language acquisition among simultaneous bilinguals and second language learning. Code switching may be a way in which children learning two languages at once could more easily learn both languages. Also code switching may be used as a tool to help second language learners in better understanding how their L_2 functions in relation to their L_1.

APPENDIX

Appendix A

Paired Two-Sample T Test: Descriptive Statistics

All Code Switches				
	Mean	*Sample size*	*St. Deviation*	*SE Mean*
Second-Minute	15.2	10	7.5099	2.37
First-Minute	18.8	10	7.9415	2.51
Difference	-3.6	10	7.61	2.43

Table 3. Descriptive Statistics (All Code Switches)

Intrasentential Code Switches				
	Mean	*Sample size*	*St. Deviation*	*SE Mean*
Second-Minute	10.2	10	5.94	1.88
First-Minute	14.6	10	7.88	2.49
Difference	-4.4	10	7.59	2.4

Table 4. Descriptive Statistics (Intrasentential Code Switches)

Intersentential Code Switches				
Descriptive Statistics				
	Mean	*Sample size*	*St. Deviation*	*SE Mean*
Second-Minute	5.	10	2	0.632
First-Minute	4.2	10	1.874	0.593
Difference	0.8	10	1.687	0.533

Table 5. Descriptive Statistics (Intersentential Code Switches)

Appendix B

Paired Two-Sample T Tests: Paired Differences

All Code Switches				
95% Confidence Interval				
Lower	*Upper*	*t*	*df*	*Sig. 2-tailed*
-9.1	1.9	-1.48	9	0.173

Table 6. Paired Differences (All Code Switches)

Intrasentential Code Switches				
95% Confidence Interval				
Lower	*Upper*	*t*	*df*	*Sig. 2-tailed*
-9.83	1.03	-1.83	9	0.1

Table 7. Paired Differences (Intrasentential Code Switches)

Intersentential Code Switches				
Paired Differences				
95% Confidence Interval				
Lower	*Upper*	*t*	*df*	*Sig. 2-tailed*
-0.406	2.006	1.5	9	0.168

Table 8. Paired Differences (Intersentential Code Switches)

Appendix C

Scene-Matching Task Elements

Figure 1. Microsoft PowerPoint slide used as scene during scene-

matching task

Figure 2. Microsoft PowerPoint slide used as scene during scene-

matching task

Appendix D

Transcription Excerpt

Pre-Test

*CONFEDERATE: (***Uno y otro que te dijo…***)
*PARTICIPANT: Yeah
*CON: Okay, So now it's still two minutes ***pero*** you give directions, right?
*PAR: ***Exacto***
*CON: Okay, so, are you ready?
*PAR: Yes, I am ready
*CON: Okay, so, one, two, and three

First Minute

*PAR: (0:01) ***Sabes el gato que tiene el money bag? Está en el*** lower left corner
*CON: (0:06) Uh, I can move the… I have my bag separate and my cat separate
*PAR: (0:11) ***A pues mira***. move the cat first
*CON: (0:13) ***Cuál? Cuál de los dos gatos?***
*PAR: (0:15) ***El, el,*** the Siamese cat
*CON: (0:18) Okay
*PAR: (0:18) Yeah
*CON: (0:18) Uh huh
*PAR: (0:19) Siamese cat ***lo pones como que ahi*** …chillin' in the water, eh
*CON: (0:23) ***Eh? Qué lado?***
*PAR: (0:24) ***En el lado izquierdo de debajo***
*CON: (0:26) ***Donde están las florecitas?***
*PAR: (0:27) ***Donde están las florecitas, exacto***
*CON: (0:28) Okay
*PAR: (0:28) ***Entonces el*** money bag ***que tiene el símbolo de*** money ***como tal, está*** like ***encima del gato como que en la pata, en la pata derecha***
*CON: (0:39) So it's like a greedy cat
*PAR: (0:40) ***Exacto, se le ve ponga la pata pero esta cubriendo ahi***
*CON: (0:44) Okay
*PAR: (0:44) ***Se… justo encima del gato está el*** gorilla(engl.)
*CON: (0:47) uh huh, en…
*PAR: (0:48) Like,
*CON: (0:48) En… ***Encima de los edificios?***
*PAR: (0:49) ***Encima de los edificios***. It's actually touching, like, ***con la pata trasera está to… está tocando como que el pico de uno de los edificios***
*CON: (0:56) Okay, so it's like…
*PAR: (0:57) ***Está ahi***
*CON: (0:57) …it's King Kong
*PAR: (0:58) ***Exacto. Y*** next to the, to the frickin' monkey, the gorilla (engl.) ***está el esto de*** pounds, ***o sea***

Second Minute

*CON: (1:07) ***Aye, aye***, The euro (engl.)
*PAR: (1:07) ***Euro***(esp.), ***euro***(esp.). ***Exacto, de la euro***(esp.)
*CON: (1:08) Yeah, okay, so
*PAR: (1:09) ***está como si lo estuviese agarrando***
CON: (1:11) Está (…)
*PAR: (1:12) I know ***está*** like covering, ***el right hand de***
*CON: (1:16) Yeah
*PAR: (1:17) ***De mi punta de vista por lo menos de …, entonces***
*CON: (1:18) Okay
*PAR: (1:19) ***Arriba está el, el balloon…***
*CON: (1:21) mhm
*PAR: (1:21***)…Rosado***
*CON: (1:22) Uh huh
*PAR: (1:22) Next ***el medio de, del*** screen, ***pero hace arriba pegado al, al*** upper part of the slide ***está el*** rocket
*CON: (1:31) Okay, like parallel to the balloon?
*PAR: (1:33) ***Exactamente***
*CON: (1:33) Okay
*PAR: (1:34) ***Y justo debajo del*** rocket ***en el no es en el medio del*** screen but ***un poquito más arriba***
*CON: (1:39) Mhm
*PAR: (1:39) ***Está el*** butterfly
*CON: (1:41) Okay
*PAR: (1:42) And then it's like on top of the bone. El bone ***sería lo que está en el medio del del*** screen
*CON: (1:45) Okay, got it
*PAR: (1:46***) Debajo está el*** bicycle, ***pegado***
*CON: (1:48) ***En el agua***
*PAR: (1:49) ***Exacto, en el agua pegado quizá un poquitín más a de la derecha***
*CON: (1:54) Okay
*PAR: (1:54) Center left ***por decirlo así***. Center right, I'm sorry
*CON: (1:57) Okay
*PAR: (1:58) ***Entonces justo en la***

Post-Test

*PAR: Uh, damn it
*CON: Ah, no, no ***queda***
*PAR: Too many things!
*CON: ***Gato (…)***
*PAR: ***El gato, el libro, y hay (…) que mal***
*CON: Okay
*PAR: Okay, wait. Uh, ***pero el próximo slide ahora*** two minutes, right?
*CON: Two and a half
*PAR: Two and a half, ***exacto***
*CON: Yeah
*PAR: Yeah, ***(…) (SPAN)*** oh my god! I'm gonna have to step up my game. ***Estaba intenso!***
*CON: Okay, so are you ready?
*PAR: Okay
*CON: Yeah, breathe
*PAR: (laughter)
*CON: ***Una, dos, y***

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