

EFFECT OF WITHHOLDING ACOUSTIC CUES TO ENGLISH-SPANISH CODESWITCHING IN WH-QUESTIONS

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ABSTRACT

The amount and type of mixed language used in one bilingual context can affect the language mode as the activation of each language will be altered, thus code-switching can serve as a scope to investigate language mode. Code-switching is the linguistic phenomenon when more than one language is used in one utterance. A line of studies showed that there can be an additional cognitive cost for bilinguals in a code-switching context. The present study investigates the role of acoustic cues in auditory recognition of English-Spanish CS utterances aiming at an intonational language pair (English-Spanish). The present study seeks to expand the conclusions made in Shen et al. [1] by gathering evidence from a different type of language pair. A two-experiment setting with 4-version design is used to test if acoustic cues are anticipatory information to upcoming CS and how segmental and suprasegmental work together code-switching context.

Keywords: Code-switching, Language mode, Bilingualism, Intonation, Suprasegmental

1. INTRODUCTION

1.1. Bilingual mode

Bilingual communication is a common practice in almost all the countries around the world and constitutes of an important area in linguistic studies [2]. Bilingual communications differ from monolingual in that bilinguals can alter their ways of communication according to the counterpart: when bilinguals are with monolinguals, they may avoid using their other language(s) while when they communicate with other bilinguals who share their language(s), they may change completely to the other language or bring elements of the other language(s) into the one already in use [3]. This difference in using language(s) has been discussed by Grosjean [3] as bilingual and monolingual language modes: language mode is the state of activation of their languages (say language A and language B) and language processing mechanism at a given point of time, or a specific occasion of communication: the level of activation for language A and B along the language-mode continuum, as illustrated in his work

(Figure 1). As a bilingual speaker moves along the language-mode continuum in different linguistic contexts, the amount of use of the other language (guest language), the amount and type of mixed language use, the ease of processing the two language and the frequency of the base-language change will undergo changes accordingly. One common practice when bilingual communicates in bilingual mode is code-switch.

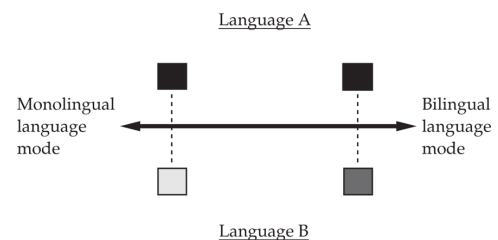


Figure 1: A visual representation of the language-mode continuum

Note. From “Bilingual and Monolingual Languages Modes,” by François Grosjean, 2013, *The Encyclopedia of Applied Linguistics*, Copyright 2015 by Blackwell Publishing Ltd.

1.2. Code-switching communications

Code-switching (CS) is the linguistic phenomenon when more than one language is used in one utterance. As a result of language contact, in US Latino communities the alternating use of Spanish and English in the same conversational event is quite common [4]. Toribio’s case studies [4] has shown that despite some low prestige associated with code alternation, the practice of code-switching is commonly used and even some use the alternation of English and Spanish in their speech to signal social identities.

In comparison to a monolingual (unilingual) discourse, more complex processes are involved in recognition, production, and comprehension in a bilingual context. Grainger and Beauvillain’s study [5] reported that the effect of language alternation depends on orthographic information. Soares & Grosjean [6] found that despite the bilingual participants’ response times in lexical decision task in monolingual modes were identical to the monolinguals, bilinguals’ response times to code-switched word targets in the bilingual mode were significantly slower.

Studies have found consistently a small reaction time delay as proofs of switch cost in production and such cost can be modulated by both individual difference and contextual factors [7, 8, 9]. Amengual's study [10] found that different Spanish bilinguals produce a less target-like lateral when in bilingual mode. Olson's study [11] by using eye-tracking paradigm extended the line of production-oriented switch costs research to auditory comprehension.

1.3. Cue to code-switch

Since there is a performance cost for code-switching communication, whether there is information in the discourse/context to help bilinguals to cope with the higher performance cost and the higher cognitive cost? Grainger and Beauvillain [5] reported language-specific orthographic cues in language mixing context that could help bilinguals to recognize the alternation in languages. Thomas and Allport [12] further found that orthographic cues alone are not sufficient to mitigate switching cost and they argue that visual word recognition isn't language selective.

Beyond written language, Fricke, Kroll, and Dussias [13] report subtle shifts in voice onset time (VOT) before English-to-Spanish code-switches, while other studies reported opposite results [14]. Furthermore, Piccinini & Garellek [15] reported that there were shift prior to code-switches, and bilingual listeners use these acoustic cues to cope with CS utterances. Previous studies have reported segmental properties going through alternation when produced in CS context in both matrix language and switched items (eg, VOT) [13], and there were reported suprasegmental features involved in similar phenomenon (eg, intonation) [15]. Also, Olsen [16] reported that insertional code-switched tokens are produced with a degree of hyper-articulation, evidenced by an increase in pitch height and duration: that the suprasegmental realizations of code-switched tokens correspond to a degree of contextually driven predictability. Shen et al. [1] showed that in English-Chinese code switching withholding acoustic cues can cause slower recognition of switched item, reflecting the possible predictability lies in tonal cues in matrix language as the latter language shows lexical tone while the other does not, and they concluded that bilingual listeners have access to phonetic cues in the matrix language, furthermore they discussed the implication of tonal aspect of the phonetic cues to code-switching based on their acoustic analysis. In Shen et al.'s study the language pair under study consists of a tonal language and an intonational language and they found evidence in the linguistic property (tone) that plays a much more

important role in one language than the other. Then what will we find if we compare a language pair that has less distance: Spanish – English.

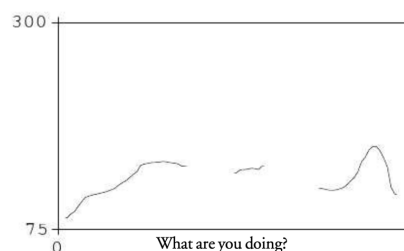


Figure 2: Example of the pitch contour of an English wh-question produced by an English speaker

Note. From "A Comparative Analysis of Intonation Between Spanish and English Speakers in Tag Questions, Wh-Questions, Inverted Questions, and Repetition Questions," by Maria Gabriela Valenzuela Farías, 2013, *Revista Brasileira de Linguística Aplicada*.

1.2. English and Spanish bilingual intonation

In monolingual speech, the wh-questions in English and Spanish shows rather similar syntactic structure:

- (1) ¿Dónde compraste estos libros?
Where buy_{PAST-2S} these books
- (2) Where did you buy the books?

However, when comparing pitch contour of wh-questions in American English (participants from Minnesota) reported in Farías (2013) and Mexican Spanish (participants from México DF) reported in De la Mota, , Butragueño & Prieto (2010), even the general tendency is the similar rising-plateau-rising-falling, in English we can observe a more contrastive comparison between the plateau and the rising-falling pitch change in final position (Figure 2 and Figure 3).

Bowen's study [17] suggested that Spanish speakers reading utterances in English will negatively transfer the intonation patterns of their L1. Farías [18] showed that Spanish Wh-questions produced by the English participants had the tendency to end with rising intonation, as opposed to the falling contour given by the Spanish speakers to English sentences.

The speaker in Piccinini and Garellek's work [15] showed that her speech shows that the code-switching utterances has a more similar F0 contour to the embedded language, which is in line with the findings from Shen et al. [1] where matrix language had tonal changes and thus language users can use such information to anticipate code-switch and mitigate the switch cost.

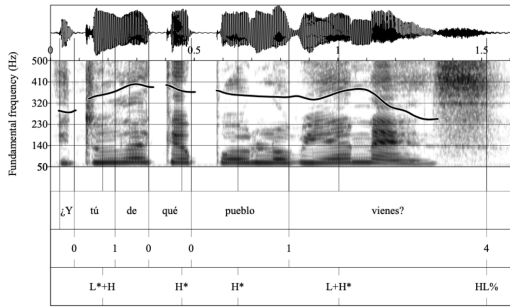


Figure 3: Example of the pitch contour of a Wh-question produced by a Spanish speaker
Note. From “Mexican Spanish Intonation” by Carme de-la-Mota, Pedro Martín Butragueño and Pilar Prieto, 2010, *Transcription of intonation of the Spanish language*, Copyright 2012 by LINCOM publisher.

2. PRESENT STUDY

The present study seeks to expand the conclusions made in Shen et al. [1] by gathering evidence from a different type of language pair: English-Spanish (intonational languages). More specifically, we are looking into late learners of Spanish who are native speakers of American English and their manner in recognizing and comprehending English-Spanish code-switching utterances.

Research Question 1: In English-Spanish CS Wh-questions, are English learners of Spanish able to make use of acoustic cues to cope with switch cost?

Research Question 2: Are the acoustic cues (segmental and suprasegmental) helping mitigate switch cost by providing anticipatory information?

We designed a two-experiment setting that will provide with us more evidence of whether listeners are able to use acoustic cues to mitigate the higher cognitive cost in code-switching context to in an anticipatory manner or not. In addition, we also designed 4-condition stimuli setting using splicing and resynthesizing recordings so that we can have a better control over segmental and suprasegmental properties of the utterances, which will provide us with preliminary understanding in how these two levels of acoustics work together in a code-switching context.

3. METHODOLOGY

3.1. Listeners (participants)

We aim to recruit a total of 60 participants, which is slightly above the quantity of participants in the Shen et. al. study (42 participants). Spanish learners who are native speakers of English will be recruited for this study. Participants should be adult native speaker of northeastern American who are able to consent in

English; currently actively learning/using Spanish; language level from intermediate to advanced and no self-report hearing or visual impairment. Participants will either receive course credit or a monetary compensation for their participation.

The language history data of the participants will be collected in the form of the Language Background Questionnaire, asking about their self-report language proficiency, age of acquisition of the second language, language use, language exposure, bilingual profile, and language proficiency in Spanish, etc. The Language Background Questionnaire consists of four parts: an adapted Language History Questionnaire [19], an adapted Bilingual Language Profile [20], an adapted Bilingual Switch Questionnaire [21], a language proficiency test (Lextale-Esp)[22].

All the participants will be randomly and equally split into two groups: Group A and Group B for the experiments.

3.2. Auditory Stimuli and Splicing

All the stimuli used in this study are all Wh-question, written for created by us. The target sentences are designed to be intrasentential code-switching Wh-questions that have English as matrix language and only the last lexical item in then sentence are switched to Spanish (eg. Where is my *perro*?). To avoid conflict, all switched items are preceded by a possessive adjective in English. All the switched items in target sentences are designed to be easy to visualize in an illustration and are not culturally embedded in either Hispanic or English language. Additional sentences including Spanish unilingual, English unilingual, Spanish-English code-switching are also created for splicing and filler use. A 30-year-old female speaker of Mexican (Mexico City) Spanish recorded all the stimuli through Zoom [23], recoded using the built-in function and Voice Memos App on iPhone. The sentences that the speaker was supposed to record were presented one by one on her screen and she could repeat many times as needed to create a most naturalistic sound. All the recordings then are manipulated using Praat[24].

Splicing and F0 manipulations are applied to the creation of auditory stimuli to create two conditions of the target sentences: spliced English-Spanish CS (ES-CS) F0 not controlled, spliced ES-CS F0 controlled.

To create the spliced ES-CS F0 not controlled condition, we use two recorded sentences, one in English unilingual, and another in ES-CS, and replace the lexical item in the same position in English unilingual sentence as the switched item in CS sentence with the word cut from CS sentence. In this way, we obtain one ES-CS F0 not controlled sentence

which in the matrix language maintain the acoustics from a unilingual context and the switched item from a CS context (Figure 5).

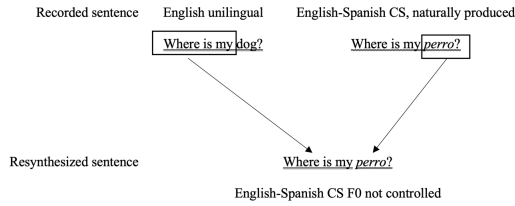


Figure 5: Splicing procedure visualized 1

Note. The double underline and wavy underline respectively represent the F0 contour of each sentence. In this case, the resynthesized sentence's F0 isn't manipulated, maintaining the original pattern from the recorded sentence of each part.

To create the spliced ES-CS F0 controlled condition, we repeat the same process as shown in Figure 5, and we add another step of F0 manipulation. More specifically, we will alter the F0 contour using the pitch contour cloning function in Praat and changing the F0 of the whole matrix sentence to the one of ES-CS, naturally produced (Figure 6). In this way we obtain one ES-CS F0 controlled sentence which in the matrix language maintain the segmental properties from a unilingual context and the switched item from a CS context, while maintaining the suprasegmental property entirely from the naturally produced CS sentence.

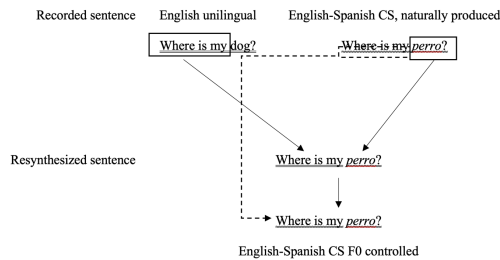


Figure 6: Splicing procedure visualized 2

Note. The double underline and wavy underline respectively represent the F0 contour of each sentence. The double underlined part of the sentence goes through a resynthesized intonational change that clones the F0 contour of the matrix sentence from naturally produced CS, thus maintaining the segmental properties from English unilingual sentence yet having suprasegments from naturally produced CS sentence.

Each list contains 20 target sentences and 35 fillers sentences. Four conditions of target sentences are included: Spanish unilingual, naturally produced ES-CS, spliced ES-CS F0 not controlled, spliced ES-CS F0 controlled.

3.3. Procedure

3.3.1. Experiment 1: Concept monitoring

Experiment 1 is a visual world paradigm task. In this task, participants will sit down in front of a computer screen, paired with a keyboard, a mouse, and a noise cancelation headphone. During the experiment, participants will use keyboard to make a choice between two pictures as soon as they hear the audio mentions the one of the two illustrated items. The choice and the reaction time will be collected. No break will be given until the end of this Experiment. Group A will get List 1 and Group B will get List 2 in this experiment.

3.3.2. Experiment 2: Switch prediction

Experiment 2 is a prediction task which aims to overtly test participants' ability to predict language switch. Before it starts, participants can take a break no more than 5 minutes. The setting is the same as in Experiment 1. Participants will see two flags on screen, one of the US representing English and the other of Mexico representing Spanish. The choice of flags is made in corresponding to the speakers variant of English and Spanish. The participants will be instructed to choose a language as soon as they can recognize using the keyboard and once they hear a switch in language, they should switch their choice by pressing the other key. The choice and the reaction time will be collected. No break will be given until the end of this Experiment. Group A will get List 2 and Group B will get List 1 in this experiment.

After the two experiments, the participant can take a break and continue with the Language Background Questionnaire where the linguistic background and Spanish proficiency will be registered.

4. PREDICTION

This study is currently at the stage of IRB pending.

In line with the results reported in Piccinini & Garellek's study [15] and Shen et al. [1], we predict that both segmental and suprasegmental properties of the matrix language will provide the listeners with cues to switch language, and the two levels of properties work in a collaborative manner. More specifically, we predict that participants in general will should a shorter reaction time if they achieve a higher proficiency level. Among the three CS conditions, we predict that the participants react the fastest in both experiments, followed by the controlled F0 condition as the intonational information is preserved in the sentences, and the slowest would be the simply spliced one, for its lack of any acoustic cue.

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