**Switching in Wh- question: intonational convergence in language mixing production**

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**Introduction**

Code-switching (CS) is the linguistic phenomenon when more than one language is used in one utterance. In comparison to a monolingual discourse, it is reported in a line of studies that more complex processes are involved the production, recognition and comprehension of CS utterances: in Grainger and Beauvillain’s study (1987) performance costs was reported in their lexical decision task when bilingual participants are involved in switching languages when recognizing lexical items; Soares & Grosjean (1984) reported the bilingual speakers who can perform similar to monolinguals in monolingual context still showed a slower lexicon access in the bilingual speech.

Some studies reported opposite results suggesting that there’s no difference between phonetic productions in monolingual versus code-switching utterances (Grosjean & Miller, 1994). Fricke, Kroll and Dussias (2016) report subtle shifts in voice onset time (VOT) before English-to-Spanish code-switches. Piccinini and Garellek (2014) report subtle shifts in intonation prior to code-switches in either direction. They further found that bilingual listeners use shifts in VOT and intonation as cues to anticipate code-switches. These phonetic cues to upcoming code-switches (‘code-switching pronunciation’) may allow listeners to cope with switch cost. On the other hand, Shen et al. (2020) pointed out that, code-switching pronunciation (phonetic cues to upcoming code-switches) could potentially be another barrier for the listeners when recognizing and comprehending CS utterances due to preservative coarticulation of matrix language phonetics into the code-switch, and vice versa from the switched item into the matrix language, which could be detrimental to recognition.

By looking into how do pronunciation of matrix language and of switch items interact could provide us with a possible explanation to the former addressed conflict between the possible role of code-switching pronunciation in CS production and comprehension. Shen et al. (2020) summed up three possible mechanisms:

…*blending mechanism* by which code-switching pronunciation might represent a blend of the phonetic features of both languages (Grosjean, 2012; Olson, 2013) … *preparation mechanism* by which code-switching pronunciation might reflect articulatory gestures that are preparatory to the production of a specific code-switched target… A third possibility is that code-switching pronunciation might reflect *global cognitive costs* of code-switching.

As formerly mentioned, many previous studies have reported segmental properties going through alternation when produced in CS context in both matrix language and switched items (eg, VOT in Fricke, Kroll and Dussias, 2016), and there were reported suprasegmental features involved in similar phenomenon (intonation in Piccinini & Garellek’s study, 2014). Also, Olsen (2012) reported that insertional code-switched tokens are produced with a degree of hyper-articulation, evidenced by an increase in pitch height and duration.

**Intonation transfer for Spanish and English**

According to Spaii and Hermes (1993), pitch variations are essential components not only to distinguish the speaker's intention, but also to identify non-linguistic tasks such as emotions, social status, and personalities. Non-native speakers of English (in our case, focusing specifically on Spanish speakers), show a hard time acquiring the intonational patterns in English. Since Spanish is a language with a narrow variation in intonation, ESL learners may tend to transfer their pitch into English, having as a result a "flat" sound (Celce-Murcia et al., 1996). In Bowen’s study (1956), it was suggested that Spanish speakers reading utterances in English will negatively transfer the intonation patterns of their L1, for example, a Spanish emphatic sentence, such as "he does eat pasta" (El sí come pasta) to an English speaker is perceived as annoying one. This is attributed to negative intonation transfers. The same effect occurs if an English speaker speaks the same sentences, transferring English intonation into Spanish utterances.

Farías in her production study (2013) tested the differences and similarities in intonation when producing tag questions, wh-questions, inverted questions, and repetition questions among native English speakers and ESL Spanish speakers. Their results showed that 100% of the participants who were native English speakers ended the questions with a falling contour, while more than half (66%) of the L1 Spanish speakers can produce such English sentences with the same falling contour. Spanish wh-questions produced by the participants had the tendency to end with rising intonation, as opposed to the falling contour given by the Spanish speakers to English sentences. Another difference in producing wh-question in English and Spanish for the L1Spanish speakers is the mean pitch, as the then mean pitch is 180Hz when they are producing English target items and 143Hz in Spanish.

The present study will be in line with Farías’ (2013) study and the former mentioned CS studies focus on production difficulties, looking into how L1 Spanish L2 English heritage Speaker in USA produce code-switched wh-questions that started in English and ends in Spanish in a bilingual context. Two production experiments are designed to collect production data. We hypothesize that matrix language (English) will be affected by the embedded language (Spanish), meanwhile the switched item will show a falling contour as in matrix language’s intonation pattern rather than rising contour in Spanish.

**Methodology**

***Experiment 1 Reading sentences***

The participants will read out a list of wh-questions prepared by the researchers without any preparation. The list of wh-questions consists of 15 sentences: 5 in unilingual English, 5 in unilingual Spanish and 5 in English-Spanish CS (starts in English and terminates in Spanish). Each group of 5 sentences contains one of the following types of wh-questions: what(qué), where(dónde), who(quién), when(cuándo), how(cómo). The sentences produced by the participants will be recorded and send the Praat for further analysis.

***Experiment 2 Code switching map task***

The code-switching map task is designed to elicit more naturalistic CS uttenrences for the participants, following the design of experiment 3 in Beatty-Martínez and Dussias (2017). The participant will have 3 map tasks to finish, in which they should pair the items on the table with corresponding image, to achieve that the participant should ask the researcher questions as “What does the little boy want?” “Who has the red apple?” “Where is the tree?”, and for each type of the questions there will be a designated map (together with objects). There are 9 objects for each map task, grouped by three, each group includes the object that share the similar cultural load: neutral object that doesn’t suggest any cultural background (eg. apple, desk), English object that are more related to English context (regarding the language history reported by the participants, eg. bacon, donut), and Spanish objects that are related to their heritage (in our case, Mexican, eg. tortilla). The task will start with the researchers showing the participants how the task is done, by switching the roles and researchers asking questions and participants giving instructions, during which the researchers will intentionally code switch depending on the cultural load of the object, passively indicating to the participant that they can feel free to do the same in the real task. Additional trial will be added for the participants to ask the same questions in unilingual Spanish mode. The sentences produced by the participants will be recorded and send the Praat for further analysis.

***Participants***

A total of 40 Spanish heritage speakers (20 male, 20 female) will be recruited for the present study. All participants but one completed either this Experiment 1 and Experiment 2. When recruiting, all of them self-reported as intermediate-advanced level Spanish speaker who have at least the level of B2 under DELE scheme. Each of the participants finished an adapted language history questionnaire based on LHQ3 (Li, Zhang, Yu, Zhao, 2020), an adapted DELE exam testing their reading comprehension, grammar, listening comprehension and speaking skills, and an adapted BSWQ (Rodriguez-Fornells et al., 2012) after the two experiments. The language proficiency test result shows that all the participants are as fluent as their claim when being recruited in comprehension and speaking tests, while 2 of them had a beginner-intermediate level of proficiency for grammar test. The participants all live in the same community where the most commonly used variate of Spanish is Mexican Spanish, they are all born in Mexico and moved to the US with their entire family before age of 8, and have been living in the US for at least 15 years. All participants reported regularly code-switching with friends or family.

The participants’ language dominance is evaluated by Bilingual Language Profile (Birdsong et al., 2012) integrated in the LHQ3. The qualitative questions shows that all the participants tend to speak in Spanish within their families and English is more dominant in working and studying environments. The Bilingual Language Profile result shows that, they are all English dominant. BSWQ result shows that they are frequent code switchers that equally switch in either of the directions. The family and community they live in also is reported to be an environment where CS regularly happens.

**Result and predictions**

The result to be analyzed are the contour of the produced wh-questions, as well as the mean pitch of each recording.

We predict the following results.

The mean pitch of unilingual English sentences and the unilingual Spanish sentences will show significant differences. The differences can be observed in both tasks. The CS utterances will show a mean pitch that in between them. More detailed analysis on each part of the CS utterances might show that, the mean pitch for matrix language and for embedded language also are different in a consistent way as the unilingual groups, but the differences is less significant as the two language are interacting in the same sentences.

The analysis of the contours may show that, the unilingual English sentences and the unilingual Spanish sentences will show consistent result as Farías’ (2013), showing that the heritages speakers are able to produce the most commonly accepted intonational patterns (in unilingual context) for each unilingual mode. And the CS contours may show that, although the final words are in Spanish, they are integrated into a English intonational context, resulting in being produced in a English wh-question falling tone.

The result of experiment 1 and experiment 2 should suggest a consistent pattern, although due to the nature of each task, the experiment 1 will show more distinction of mean pitch as well as the F0 contour among three language modes (unilingual English, unilingual Spanish, CS mode).

The limitation if the current study is that, we only examine the L1 Spanish L2 English speakers from Mexican heritage communities in the US. All the participants we recruit will be advanced speakers in both languages. However, CS doesn’t only occur with advanced bilinguals. For those who might not be fluent in one of the two languages can also get involved in CS conversations. For them, the intonational pattern might have different tendency. Also, future studies can expand the scope to more intonational meanings other than simple wh-questions, as well as other language pairs. More precise tools can also help in future studies to determine which of the formerly mentioned mechanisms can offer a better explanation for the intonation convergence.

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