

Monolingual stimuli as a foundation for analyzing code-switching data

Shane Ebert

University of Illinois at Chicago

Bryan Koronkiewicz

The University of Alabama

1. Introduction

While studying the linguistic knowledge and language use of bilingual speakers can provide insight into human language more generally, there are a variety of methodological concerns which can affect such research (for a broad overview, cf., Grosjean, 1998). In this paper, we focus on one particular area of bilingual research, the study of the grammatical aspects of code-switching (CS).

Previous research has addressed a variety of potential methodological issues in this area of bilingualism (González-Vilbazo et al., 2013; Grosjean, 1985; Gullberg, Indefrey, & Muysken, 2009; MacSwan & McAlister, 2010; Toribio, 2001a). With particular focus on CS, such concerns include naturalness of lexical items at switch points, the stigma some speakers associate with CS, where a speaker is on the language mode continuum, and the naturalness of the CS environment. González-Vilbazo et al. (2013) identify three broad categories that can be used to group related methodological issues in CS: (i) project design, (ii) experimental procedure, and (iii) participant selection. The current work focuses explicitly on the first of those categories. Although project design can include a number of possible methods of data collection, including Event-Related brain Potentials (van Hell et al., 2017), eye-tracking (Valdés Kroff et al., 2017), a recounting task, sentence matching, sentence repetition, and priming (for a thorough overview of different research techniques in CS see Gullberg et al., 2009), here we are concerned with a common source of data for studying the grammatical aspects of linguistic competence, not just in code-switching but more generally: acceptability judgment tasks (AJTs).

We argue that research which makes use of CS data of this type must also incorporate monolingual stimuli into the experimental design. To be clear, this does not refer to data obtained from monolingual individuals but rather monolingual stimuli judged by the same bilingual participants who are being asked to judge code-switched stimuli. We do so by reviewing two sets of experimental CS data that we collected. Specifically, we will show that without the incorporation of monolingual stimuli, the data obtained can be misinterpreted. To establish that bilingual participants completing an AJT should judge not only CS stimuli but also monolingual stimuli, we will show that the answer for each research question will change depending on the availability of those monolingual stimuli. Importantly, we are concerned here with the implications that experimental design has on analysis and interpretation, rather than the theoretical questions we have chosen for illustrative purposes. Consequently, we will largely limit our discussion of

theoretical implications of the data presented to those that directly address the research questions.

2. Theoretical framework and assumptions

2.1. Minimalist approach to code-switching

In order to demonstrate the concrete effects that methodological choices can have on the interpretation of CS data, we adopt a specific theoretical framework, a Minimalist approach to CS (cf., MacSwan, 1999, for the first proposal and González-Vilbazo & López, 2011, 2012, for further discussion). As a generative approach to CS, this framework assumes that there are no features or mechanisms apart from those already present in the two individual grammars when mixing languages. That is to say, there is no designated matrix or embedded language, language feature, etc., i.e. no *third grammar*. CS is understood to be merely a multilingual extension of the contemporary generative operations of Merge and Agree (Chomsky, 2013), only differentiating itself from monolingual speech in that lexical items are drawn from both lexica. Under such an approach, intrasentential CS stimuli can be designed to create unique combinations of features not easily observed in monolingual sentences, and the analysis of such data can be used to further explore a myriad of linguistic phenomena.

Crucially, this provides us with a theoretical grounding for proposing the central research question of each experiment and determining whether the collected CS data is sufficient to answer those questions. While the specific details of our analysis of the presented CS data depend on our choice of framework, any framework in which AJTs can provide evidence for theoretical claims should benefit from monolingual stimuli in the sense argued here.

2.2. Exploring assumptions in monolingual and code-switching data

There are some interesting, perhaps unexpected, complications in the interpretation of the acceptability of a given code-switched sentence that do not arise with monolingual sentences judged by monolingual speakers. Essentially, there are some underlying assumptions about those monolingual sentences, and the participants judging those sentences, that do not automatically hold with code-switched sentences. We address two of these issues specifically, as they will each be a direct springboard into the methodological concerns we address in more detail in the individual experiments presented later on.

2.2.1. Different sources of acceptability in code-switching

CS research is distinct from monolingual research in that not only can the requirements of one of the individual languages affect the acceptability of a given sentence but so can the interaction of the features of the two languages involved, essentially due to the CS itself.

To illustrate this more explicitly, first consider the monolingual sentences in (1), where there is a

contrast between first person singular and first person plural pronouns.

- (1) a. We linguists analyzed the sentences.
b. * I linguist analyzed the sentences.

Having uncovered a pair of minimally different sentences that contrast in acceptability, we can explore the properties of that contrast to better prepare us to account for it. If the difference is not based on word order, as is the case here, then the unacceptability likely derives from properties of the lexical items that have changed, in this case, the different subjects. This suggests that it is something about the internal structure of the subject that allows for what appears to be a first person plural pronoun in (1a) but not a first person singular pronoun in (1b).¹

It is also important to establish the degree to which the contrast in acceptability between the lexical items depends on the original syntactic structure tested. In this case, the unacceptability of (1b) does not appear to interact with other properties such as the transitivity of the verb, as seen in (2a), or the argument status of the subject, as seen with the unaccusative verb in (2b), since these sentences continue to be unacceptable.

- (2) a. * I linguist talked.
b. * I linguist fell.

With the following sentences from Spanish-English CS, though, there are additional factors to consider, as we will see below.²

- (3) a. *Esa señora* writes very quickly.
'That lady writes very quickly.'
b. * *Ella* writes very quickly.
'She writes very quickly.'

When there is a code-switch between a subject Determiner Phrase (DP) and the verb, such as in (3a), the code-switch is acceptable, but when the subject is a pronoun, as in (3b), the same code-switch becomes unacceptable. Contrasts of this type have been extensively reported in the CS literature, dating back to Timm (1975). Like with the monolingual examples above, it is important to explore variations of the structure under study to determine how generalizable the contrast is. Important, though, is the fact that CS introduces additional sources of variation. For example, CS

1 Whether these pronouns are in fact functioning as determiners, as some analyses of these data claim (e.g., Déchaine & Wiltschko, 2002), the properties at issue continue to be internal to the subject.

2 Unless otherwise indicated, these and subsequent sentences related to pronouns come from Experiment 1, discussed in detail in §3.

adds language as an additional factor in constructing sentences, so the contrast may depend on the direction of the code-switch.³ In (3), the subject is in Spanish and the verb is in English, but the same contrast holds in the other direction, as seen in (4).

- (4) a. That lady *escribe muy rápido*.
'That lady writes very quickly.'
- b. * She *escribe muy rápido*.
'She writes very quickly.'

If not the direction of the switch, perhaps it is something about a pronoun in this particular position, at least in part. Consider, though, the CS data in (5) from Timm (1975).

- (5) * She sees *lo*.
'She sees it.'

The Spanish pronoun *lo* 'it' is in object position, yet the sentence continues to be ungrammatical.⁴ Maybe the unacceptability of (5) stems from properties of one or both of the individual languages, such as English or Spanish requirements for object pronouns. For example, Poplack (1980) proposes the Equivalence Constraint, where CS occurs "at points in discourse where juxtaposition of L1 and L2 elements does not violate a syntactic rule of either language" (p. 586). And in fact the Spanish pronoun here, and its English equivalent, do not have the same status in this position, as seen in (6) where the English pronoun *it* in (6a) is acceptable, but the translation equivalent *lo* 'it' in (6b) is not.

- (6) a. She sees *it*.
- b. * Ella ve *lo*.
'She sees it.'

Crucially, while the Equivalence Constraint can account for the unacceptability of (5), it does not account for the contrast in (3) and (4), where the same bilingual speakers find preverbal subject DPs and subject pronouns to be acceptable in both English and Spanish⁵:

- (7) a. He sleeps during the day.
- b. Él duerme durante el día.

³ For some discussion on asymmetries in CS, where a code-switch is only acceptable in one direction, see González-Vilbazo and López (2011) and Bandi-Rao and den Dikken (2014).

⁴ Here we set aside properties of clitic pronouns, including *lo*, that may also be relevant to focus on the general issue of analyzing CS data.

⁵ Note that, because Spanish is a pro-drop language, the acceptability of (7b) is subject to pragmatic restrictions.

- c. Those ladies sleep during the day.
- d. Esas señoras duermen durante el día.

Instead, it is something about the code-switch between the pronoun and the finite verb that makes the sentences in (3b) and (4b) unacceptable. What that something is precisely is not quite clear yet, but it will be addressed in more detail in §3. A sufficient answer for now is that it has to do with the syntactic relationship between the subject and the verb, as there are structural differences between the lexical DPs in (3a) and (4a) and the pronouns in (3b) and (4b).

In short, CS introduces as an additional factor: the possibility that acceptability comes from not just the requirements of the two languages but also the interaction of those requirements, emerging as a general property of the computational system. We will look at this use of monolingual stimuli to account for this factor more closely in our discussion of Experiment 1.

2.2.2. Comparability of I-languages

Whether using the more traditional introspective intuitions of a small group of consultants or conducting a formal experiment with a larger pool of participants, there is an underlying assumption that the consultants or participants have comparable I-languages. More precisely, while no two speakers have the same I-language in all contexts, it is assumed that the I-languages of those speakers sufficiently overlap with respect to the phenomenon under study such that their judgments can be treated as reflecting the same “language”.

This overlap is generally ensured by controlling for the linguistic background of the speakers. This is because, with monolingual speakers, the speech community is generally a sufficient proxy for I-language comparability. The level of granularity for choosing a speech community with monolingual speakers will depend on the phenomenon under study, of course. For example, in some cases “English speaker” may be sufficient. In other cases, speakers of Southern U.S. English may be required, and still others, the speech community may be African American New Yorkers. Importantly, in each case, the speakers within that community are considered comparable, once the relevant sociolinguistic factors are controlled for.

With bilingual speakers, such as the early bilinguals discussed in this article, additional individual factors can have a larger effect on the resulting I-language, leading to more variation. Common examples from the literature include whether or not the speaker has siblings and their relative ages, what the age of arrival of the speaker is, the proficiency of the speaker’s parents in the majority language, and the size and language practices of the local minority language community, among other factors (cf., Montrul, 2008, 2010). These factors can affect a speaker’s language development in a variety of ways. For example, heritage Spanish speakers who have older siblings who already have a strong command of English often speak in English with that sibling a majority of the time, reducing the amount of exposure to and use of Spanish in the home. On the other hand, speakers

who live in a sufficiently populous minority language community will have more exposure to and use of the minority language.

It is here that monolingual stimuli can also play a role. By comparing bilingual participants' judgments of monolingual stimuli, a researcher can assess the degree to which a group of speakers has the same intuitions in each language with regard to a particular phenomenon and, therefore, the degree to which they have comparable L1-languages. We will explore this use of monolingual stimuli in more detail in Experiment 2.

3. Experiment 1: Pronouns in Code-switching

3.1. Background and research question

The behavior of pronouns in CS has received quite a bit of attention throughout the years. Recently, researchers have investigated whether there is a categorical distinction between pronoun and lexical DPs when switched with a finite verb (Fernández Fuertes, Licerias & Alba de la Fuente, 2016; van Gelderen & MacSwan, 2008). Experiment 1 comes from Koronkiewicz (2014), where he proposes that the acceptability of a code-switched pronoun is in line with Cardinaletti and Starke's (1999) pronoun typology. For reasons of space, we limit ourselves here to a brief overview.

Cardinaletti and Starke (1999) propose two major pronoun types to account for the systematic differences between pronouns: strong pronouns, which are DP-like, and weak pronouns, which are not. The authors provide a detailed syntactic analysis of these two types of pronouns, as well as a third type, but the strong-weak distinction is sufficient for our purposes. Importantly, the distinct properties of the two types of pronouns create contrasts in acceptability based on their syntactic and prosodic contexts. Cardinaletti and Starke illustrate this by using examples from French, where there are two subject pronouns, one which is traditionally called a strong pronoun, as in (8a), and another called a weak pronoun, as in (8b).

- (8) a. Lui est beau.
'He is pretty.'
- b. Il est beau.
'He/It is pretty.'

Cardinaletti and Starke argue that strong pronouns are able to be both coordinated (9a) and modified (9b) while weak pronouns (here *il* 'he') are not.

- (9) a. Lui/*Il et Jean sont beaux.
'He and Jean are pretty.'
- b. Lui/*Il seul est beau.
'He alone is pretty.'

They also compare the acceptability of strong and weak pronouns in several other contexts and in other languages. The key result is that, if their proposal is correct, the interaction between the context and the acceptability of a given pronoun provides evidence regarding whether to categorize a given pronoun as strong or weak.

Note, however, that neither Spanish nor English has distinct lexical items for strong and weak subject pronouns. This is not an issue in a structure where only strong pronouns are acceptable, such as in (9) above, but it does produce a potential ambiguity with subject pronouns that are neither in focus nor prosodically stressed, what we will refer to as unaltered pronouns, such as in (10).

- (10) a. He sleeps during the day.
b. Él duerme durante el día.

The pronouns in (10) are not in a context that necessitates categorizing them as strong, but that alone is not enough to rule that option out entirely. Theoretically they could still be either strong or weak. To resolve this, Cardinaletti and Starke (1999) propose an *Economy of Representations* principle which gives preference to syntactically simpler or smaller structures, in this case, weak pronouns. According to their proposal, then, the pronouns in (10) should be weak.

Since the contexts in which strong and weak pronouns are acceptable are based on cross-linguistic structural properties and not properties specific to one language, the same patterns of acceptability could plausibly be observed in CS as well. This leads to the following research question:

Experiment 1 Research Question: Does the acceptability of pronouns in Spanish-English code-switching align with Cardinaletti and Starke's categorization of pronouns?

In the case of Spanish and English CS, there are two possible outcomes that would support an alignment between the patterns of CS and the proposal by Cardinaletti and Starke (1999). Recall that the examples in (3b) and (4b) showed code-switched, unaltered pronouns as unacceptable. Based on that information, one option would be that there is a distinction in acceptability wherein weak pronouns are not able to be code-switched with a finite verb, whereas strong pronouns are. Second, it may be the case that neither weak nor strong pronouns are acceptably switched. In this case, pronouns should be unacceptable in all contexts.

3.2. Method

3.2.1. Participants

Participants for this experiment were proficient Spanish-English bilinguals who began learning both languages by the age of 6 and continue to use both languages in their daily lives. This self-reported daily use was confirmed via measures of proficiency in both languages. Participants'

Spanish proficiency was evaluated using a modified version of the Diploma of Spanish as a Foreign Language (DELE, from the Spanish abbreviation), similar in form to a cloze test (Montrul, 2002, 2004). The English proficiency measure was a forty-question multiple-choice cloze test (O'Neill, Cornelius, & Washburn, 1981) that has been used in a variety of previous studies (cf., Ionin & Montrul, 2009, 2010; Ionin, Montrul, & Crivos, 2013; Montrul, 2001). In order to be included in the data analysis, participants needed a score greater than or equal to 28 (out of 40) for the English proficiency measure and greater than or equal to 35 (out of 50) for the Spanish proficiency measure. Based on these criteria, there were 18 total participants included in the data analysis, ranging in age from 19 to 31 and with a median age of 22.6. An overview of the participants from Experiment 1 is provided in Table 1.

Table 1. Participant overview for Experiment 1

	<i>M</i>	<i>SD</i>
Age of acquisition		
English	3.67	1.73
Spanish	0.22	0.71
Proficiency score		
English (out of 40)	36.56	1.80
Spanish (out of 50)	40.67	4.26
Self-reported proficiency		
English (out of 5)	4.89	0.32
Spanish (out of 5)	4.22	0.73
Self-reported language use		
English at home (%)	45.56	28.95
Spanish at home (%)	54.44	28.95
English at school/work (%)	70.56	18.62
Spanish at school/work (%)	29.44	18.62

3.2.2. *Stimuli*

The stimuli included spoken code-switched sentences involving pronouns in contexts specifically targeting the pronoun types as categorized by Cardinaletti and Starke (1999). This included weak pronouns, i.e. unaltered pronouns (11), as well as five strong pronoun contexts: modified pronouns (12), coordinated pronouns (13), cleft pronouns (14), hanging topic pronouns (15), and prosodically-stressed pronouns (16). Half the time the pronoun was in English and half the time the pronoun was in Spanish. Participants rated 8 stimuli for each type, 4 with a Spanish-to-English code-switch and 4 with an English-to-Spanish code-switch.

(11) **Unaltered pronouns (CS)**

- a. He *duerme durante el día*.
'He sleeps during the day.'
- b. *Él* sleeps during the day.
'He sleeps during the day.'

(12) **Modified pronouns (CS)**

- a. Him with the black hair *duerme durante el día*.
'Him with the black hair sleeps during the day.'
- b. *Él con el pelo negro* sleeps during the day.
'Him with the black hair sleeps during the day.'

(13) **Coordinated pronouns (CS)**

- a. He and Alex *duermen durante el día*.
'He and Alex sleep during the day.'
- b. *Él y Alberto* sleep during the day.
'He and Alberto sleep during the day.'

(14) **Cleft pronouns (CS)**

- a. *Eduardo dijo que es* him that sleeps during the day.
'Eduardo said it's him that sleeps during the day.'
- b. Evan said it's *él que duerme durante el día*.
'Evan said it's him that sleeps during the day.'

(15) **Hanging topic pronouns (CS)**

- a. Jennifer said that him, *duerme durante el día*.
'Jennifer said that him, he sleeps during the day.'
- b. *Juanita dijo que él*, he sleeps during the day.
'Juanita said that him, he sleeps during the day.'

(16) **Prosodically-stressed pronouns (CS)**

- a. She sleeps at night, but HE *duerme durante el día*.
'She sleeps at night, but HE sleeps during the day.'
- b. *Ella duerme durante la noche, pero ÉL* sleeps during the day.
'She sleeps at night, but HE sleeps during the day.'

Participants also judged spoken monolingual sentences with pronouns in the same contexts: unaltered (17), modification (18), coordination (19), cleft (20), hanging topic (21), and prosodic stress (22).

(17) **Unaltered pronouns (Monolingual)**

- a. He sleeps during the day.
- b. Él duerme durante el día.

(18) **Modified pronouns (Monolingual)**

- a. Him with the black hair sleeps during the day.
- b. Él con el pelo negro duerme durante el día.

(19) **Coordinated pronouns (Monolingual)**

- a. He and Alex sleep during the day.
- b. Él y Alberto duermen durante el día.

(20) **Cleft pronouns (Monolingual)**

- a. Evan said it's him that sleeps during the day.
- b. Eduardo dijo que es él que duerme durante el día.

(21) **Hanging topic pronouns (Monolingual)**

- a. Jennifer said that him, he sleeps during the day.
- b. Juanita dijo que él, duerme durante el día.

(22) **Prosodically-stressed pronouns (Monolingual)**

- a. She sleeps at night, but HE sleeps during the day.
- b. Ella duerme durante la noche, pero ÉL duerme durante el día.

3.2.3. Procedure

The experimental task consisted of acceptability judgments of spoken stimuli on a 1-7 Likert scale where 1 was “completely bad” and 7 was “completely good” (cf. Sprouse & Almeida (2013) and Stadthagen-Gonzalez et al. (2017) for an overview of tasks for acceptability judgments). The data were collected using presentation software known as “Ibex” (“Internet Based EXperiments”), which is designed for collecting self-paced reading data and acceptability judgments online. The

experiment was run using version 0.3.2 of the software, which can be found on the following website: <https://code.google.com/archive/p/webspr/>. The experiments were hosted on a free website for hosting Ibx experiments, <http://spellout.net/ibexfarm/>. In addition to the experimental task, participants completed a background questionnaire, task training and practice, and the proficiency measures. The participants first judged the code-switched stimuli and then the monolingual stimuli. The CS, monolingual English, and monolingual Spanish blocks of stimuli were broken up by short, non-linguistic tasks, and each block of monolingual stimuli was preceded by its respective proficiency measure. The non-linguistic tasks alternated between a simple, tile-based memory game and a puzzle composed of only square-shaped pieces. The instructions for these tasks matched the mode of the current block of stimuli.

3.3. Results and analysis

As discussed in §3.1, Cardinaletti and Starke (1999) propose contrasts in the acceptability of strong and weak pronouns based on the syntactic and prosodic contexts in which they appear. If their categorization of pronouns extends to CS contexts, then there should either be contrasts in acceptability based on the type of pronoun present (i.e., strong or weak), or there should be no differences found based on pronoun type.

Table 2. Means and standard deviations of code-switched stimuli by context

Context	<i>M</i>	<i>SD</i>
Coordinated	5.98	1.81
Modified	5.19	2.39
Cleft	4.86	2.43
Prosodically Stressed	4.35	2.60
Unaltered	2.96	4.35
Hanging Topic	2.41	2.02

The results of the CS judgments can be found in Table 2. Note that the results are not separated out by directionality of the switch (i.e., from English-to-Spanish or from Spanish-to-English) as the proposal by Cardinaletti and Starke (1999) is symmetrical for the two languages regarding the pronouns under analysis. That is to say, the predictions being made regarding pronoun type would hold regardless of the direction of the switch. To test whether the acceptability of pronouns differed by context, a one-way ANOVA was run. The results revealed a significant difference between group means ($F(5,858) = 52.097, p < .001, \eta^2 = .233$). A posthoc comparison using the Tukey HSD test indicated there were three tiers of acceptability. Coordinated pronouns were rated most acceptable, significantly higher than all other contexts ($p < .05$). Next, modified, cleft and prosodically-stressed pronouns patterned together, receiving slightly reduced ratings that were not significantly different from each other ($p > .05$). Finally, hanging-topic and unaltered pronouns patterned together ($p = .341$) with little acceptability, significantly lower than all other contexts

($p < .001$).

The key result that interests us here is the contrast between the higher acceptability of coordinated pronouns and the lower acceptability of the hanging topic pronouns. These pronoun types are sufficient to address the methodological proposal that this paper centers on, the role of monolingual stimuli in interpreting CS results. As discussed above, coordinated pronouns and hanging topic pronouns are expected to pattern together because both structures require strong pronouns. Since the acceptability of these two types of pronouns significantly differ, the results do not align with Cardinaletti and Starke's (1999) proposal, and, therefore, we are forced to answer the Experiment 1 Research Question in the negative.

Table 3. Experiment 1 code-switching and monolingual results by context

Context	CS		Monolingual	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Coordinated	5.98	1.81	6.51	1.22
Modified	5.19	2.39	4.59	2.61
Cleft	4.86	2.43	5.26	2.31
Hanging Topic	2.41	2.02	4.53	2.76
Prosodically Stressed	4.35	2.60	6.87	0.57
Unaltered	2.96	4.35	6.91	0.61

Importantly, the picture changes significantly if we incorporate the monolingual acceptability judgments into the analysis, included in Table 3 alongside the CS judgments. In order to compare the two sets of judgments, a two-way ANOVA was run comparing the CS and monolingual judgments in each of the six contexts. Note that the judgments for the monolingual Spanish and monolingual English stimuli are collapsed in this analysis. Though there are a number of crucial differences between subject pronouns in the two languages, they pattern together in Cardinaletti and Starke's categorization of pronouns, which would indicate that the predictions based on pronoun type would be the same regardless of the particular language. The results revealed a significant difference between group means for context ($F(5,1716) = 58.326, p < .001, \eta^2 = .120$), as well as for the difference between the code-switched and monolingual sentences ($F(5,1716) = 199.744, p < .001, \eta^2 = .082$). There was also a significant interaction between these factors ($F(5,1716) = 43.604, p < .001, \eta^2 = .090$). A Bonferroni posthoc comparison revealed there were no significant differences between monolingual and CS stimuli for the cleft, coordinated, hanging-topic and modified contexts ($p > .05$). While these contexts differ from each other in terms of acceptability, importantly the statistical analysis suggests that these differences are not unique to CS. In other words, the judgments for those pronoun types are not affected by whether they were code-switched or not.

The minor variations in acceptability between the cleft, coordinated and modified pronouns are

interesting, but not problematic for a researcher interested in CS. For whatever reason, coordinated pronouns were preferred above all other sentence types, regardless of whether they were code-switched or not. Hanging topics, on the other hand, do present a problem, but it is a general methodological one, not anything specific to CS. Given the experiment design, we are unable to determine for certain the source of the reduced acceptability for the hanging topics in both the CS and monolingual stimuli. One possibility is that the majority of the speakers either disfavor or were uncertain about hanging topics in both Spanish and English (and, therefore, in CS as well). It is also possible that their individual grammars do not include such a construction. A more likely source of the unacceptability would be the nature of hanging topics, as they rely heavily on the information structure of the discourse. As no context is provided during the sentence judgment task, it is possible that participants rated hanging topics as less than ideal because they were unable to contextualize them. For example, given there was no obvious reason to emphasize the pronoun—a primary use of a hanging topic—many of the sentences with pronouns as left dislocated elements were rated as unacceptable, even though it is likely that such a construction is grammatical for them in a particular discourse where emphasis is needed. Crucially, though, this absence of a discursive context affected the ratings for both the monolingual and code-switched sentences.

Significant and informative differences did emerge, however, with prosodically-stressed pronouns, which were rated significantly higher in monolingual Spanish or English than in CS ($p < .001$), receiving scores at ceiling. This comparison with monolingual data distinctively uncovers how prosodic stress results in a reduced acceptability for code-switched pronouns. Furthermore, unaltered pronouns were also rated significantly higher in monolingual stimuli ($p < .001$), receiving scores at ceiling. Given this contrast, we can reliably confirm that unaltered pronouns are disfavored in CS. Although the level of acceptability varies for these different pronoun types, what unites them is the fact that they are the only two where the judgments are directly affected by being code-switched.

Returning to the research question for Experiment 1, both unaltered pronouns and hanging topic pronouns are disfavored in CS. However, using the monolingual acceptability judgments, we can see that this is only due to CS for the unaltered pronouns. Unlike before, there now seems to be a clearer divide between the acceptability of strong and weak pronouns in CS. If unaltered pronouns are significantly less acceptable than the other pronoun types, this is compatible with Cardinaletti and Starke's proposal if we assume a distinction in grammaticality between weak and strong pronouns. Hanging topic pronouns, although considered strong pronouns, have low acceptability for independent reasons. The prosodically-stressed pronoun stimuli, although not outright unacceptable, do receive reduced ratings when code-switched, as compared to their monolingual counterparts (for more detailed discussion of this see Koronkiewicz, 2014). Regardless of the reasons for this reduction in acceptability, the inclusion of the monolingual stimuli has shifted our answer to the research question substantially. It appears that the acceptability of pronouns in Spanish-English CS does in fact closely align itself with Cardinaletti and Starke's categorization.

Notice that we could only trace the source of the unacceptability by comparing the code-switched stimuli with their monolingual counterparts. Essentially, the monolingual stimuli serve as controls for interpreting the CS data. Here we have directly shown how the inclusion of monolingual stimuli allows the researcher to distinguish between monolingual sources of acceptability already present and additional sources introduced in CS due to the interaction of the languages.

4. Experiment 2: Wh-questions in code-switching

4.1. Background and Research Question

This experiment focuses on wh-questions and, in particular, the phenomenon of subject inversion, drawing from work in Ebert (2014). Before discussing what CS can tell us about subject inversion, we will review key properties of subject inversion and wh-questions in monolingual contexts.

In both Spanish and English, the subject is sometimes required to appear after a verb or auxiliary. For example, in the English wh-question in (23a), the subject *John* appears between the auxiliary and the participle. This contrasts with the parallel declarative sentence in (23b) where the subject precedes the auxiliary and the participle.

- (23) a. What has John bought this week?
b. John has bought three books this week.

Similarly, in Spanish, the subject *Juan* appears after the verb and the participle *ha comprado* in (24a) but before both of them in the parallel declarative sentence in (24b).⁶

- (24) a. ¿Qué ha comprado Juan esta semana?
'What has John bought this week?'
b. Juan ha comprado tres libros esta semana.
'Juan has bought three books this week.'

Importantly, Spanish and English contrast not only in the position of the subject when inversion does occur, as in (23a) and (24a), but also in the contexts that require inversion. For example, in embedded wh-questions, subject inversion is no longer required in English, as seen in the contrast between (25a) and (25b), but it continues to be required in Spanish in embedded questions such as (26a), as compared to (26b).

⁶ For both Spanish and English, subject inversion is not always required in certain wh-questions, but unless otherwise noted, we will focus on those contexts where inversion is required. The contexts in which subject inversion is required also vary by dialect, but the data here are drawn from speakers of the same or comparable dialects. See §4.2.1 for details.

- (25) a. * I don't know [what has John bought this week].
 b. I don't know [what John has bought this week].
- (26) a. No sé qué ha comprado Juan esta semana.
 'I don't know what Juan has bought this week.'
 b. * No sé qué Juan ha comprado esta semana.

In order to illustrate another way in which monolingual stimuli can form a foundation for analyzing CS data, we are going to take advantage of this contrast and use CS to gain insight into subject inversion in Spanish. Here we explore general evidence regarding the role of a particular functional head, the tense head, rather than testing a specific syntactic account of inversion and the particular syntactic features or properties such an account would be based on.

A number of theories of inversion in Spanish posit that there are properties of the tense head (T) which require inversion (Barbosa, 2001; Goodall, 2001; Gutiérrez-Bravo, 2002, 2008). Under these accounts, it is argued that the *wh*-phrase establishes a dependency with T. The implementation varies, but they have in common a requirement that the *wh*-phrase moves to, or through, SpecTP (or an equivalent). Since SpecTP has already been filled, the subject cannot raise and remains in situ, after the verb, once it has undergone V-to-T movement. Not all accounts of Spanish locate preverbal subjects in SpecTP, but in the accounts cited, this position plays a crucial role. For an overview of accounts of preverbal subjects in Spanish, see Villa-García (2013). If these theories are correct, then the syntactic properties of the Spanish tense head should determine when inversion is required (i.e., when the subject is forced to remain in situ), even if other elements of the sentence are in another language, hence code-switched. The other main possibility is that these theories are correct but the necessary properties conflict with English, at least with some code-switches, leading to unacceptable sentences regardless of word order. That turns out not to be the case here.

This leads to the following research question:

Experiment 2 Research Question: Does a Spanish tense head, and the syntactic properties associated with that head, determine when subject inversion is required?

In order to answer this question, we need to look at the acceptability of different subject positions in code-switched *wh*-questions with a Spanish tense head. Consider the code-switched stimuli in (27).

- (27) a. I don't remember what *tus colegas han comprado* this week.
 'I don't remember what your colleagues have bought this week.'
 b. I don't remember what *han comprado tus colegas* this week.

The verb complex *han comprado* 'have bought' is in Spanish, and since Spanish requires V-to-T

movement (Suñer, 1994) and therefore the verb incorporates into T, we can assume that T is also in Spanish. If the syntactic properties of the Spanish tense head are the source of subject inversion in Spanish, as some accounts claim, then we can make some predictions. We saw in (26a) that only verb-subject (VS) word order is acceptable in Spanish for this type of wh-question, so this would predict that VS word order should also be acceptable for code-switched sentences like (27b). What about subject-verb (SV) word order? Recall that this is the word order preferred for English, as exemplified in (25b). If participants prefer SV word order, as in (27a), to VS word order, as in (27b), in spite of both the verb and the subject being in Spanish, then that would suggest that the syntactic properties associated with the Spanish tense head are not sufficient to determine when inversion is required.

In summary, the prediction is that, if inversion in Spanish depends on syntactic properties of the tense head, then a code-switched sentence with a Spanish tense head should require inversion in the same contexts as a monolingual Spanish sentence. Before exploring this prediction, we will review the design and methods of Experiment 2.

4.2. Method

4.2.1. *Participants*

As with the previous experiment, participants for this experiment were proficient Spanish-English bilinguals who began learning both languages by the age of 6 and continue to use both languages in their daily lives. In order to be included in the data analysis, participants needed a score greater than or equal to 28 (out of 40) for the English proficiency measure and greater than or equal to 35 (out of 50) for the Spanish proficiency measure. Based on these criteria, there were 19 total participants included in the data analysis, ranging in age from 18 to 43 and with a median age of 23.4. With respect to dialect, which affects inversion requirements in Spanish wh-questions, the majority of participants grew up in households speaking a dialect of Mexican Spanish, though there was also one participant with a background in each of the following dialects: Colombian Spanish, Ecuadorian Spanish, and Guatemalan Spanish. Depending on the region of their respective countries, these dialects generally have the canonical word orders outlined in §4.1, and importantly, this is the case for the participants. An overview of the participants from Experiment 2 is provided in Table 4.

Table 4. Participant overview for Experiment 2

	<i>M</i>	<i>SD</i>
Age of acquisition		
English	2.90	2.11
Spanish	0.26	0.72
Proficiency score		
English (out of 40)	36.37	1.46
Spanish (out of 50)	39.23	3.19
Self-reported proficiency		
English (out of 5)	4.89	0.46
Spanish (out of 5)	3.63	0.90
Self-reported language use		
English at home (%)	46.84	22.37
Spanish at home (%)	53.16	22.37
English at school/work (%)	72.11	19.88
Spanish at school/work (%)	27.89	19.88

4.2.2. *Stimuli and procedure*

The experimental task and procedure were exactly same as Experiment 1, using the same Ibx data file and accompanying materials, except that the stimuli were written instead of aural.

Participants judged both monolingual and code-switched written stimuli. The design of the code-switched sentences was based on the following factors:

- CS independent variables and their values
- Clause of the wh-question: matrix or embedded
- Complexity of the wh-phrase: simple or complex
- Position of the subject: SV, V2 or VS
- Language of the verb: Spanish or English
- Language of the wh-phrase: opposite language of the verb
- Language of the subject: Spanish or English

The full set of stimuli varied both the clause of the wh-question as well as the complexity of the wh-phrase because both of these factors affect the requirements for subject inversion in one or both languages. Three different subject positions were included: subject-verb (SV), where there is no inversion, verb-second (V2), which is English inversion, and verb-subject (VS), which is Spanish inversion. The language of the verb, the wh-phrase and the subject were varied because accounts of inversion in one or both languages posited an important role for these constituents. The same structures were used for the monolingual stimuli.

Combining all of these structures, there were a total of 160 target stimuli. Specifically, for matrix questions, there were 2 types of wh-phrases, 3 subject positions, 2 language pairings for the verb and wh-phrase, and 2 languages for the subject for a total of 24 types. For embedded questions, there were 2 types of wh-phrases, 2 subject positions, 2 language pairings for the verb and wh-phrase, and 2 languages for the subject for a total of 16 types. There were 4 lexicalizations of each of these 40 types for a total of 160 CS stimuli. For ease of exposition, however, we are going to focus on one specific subset, embedded wh-questions with a simple wh-phrase, such as the CS stimuli in (27), repeated here as (28). This will be sufficient to illustrate the role of monolingual stimuli in analyzing CS data.

- (28) a. I don't remember what *tus colegas han comprado* this week.
 'I don't remember what your colleagues have bought this week.'
- b. I don't remember what *han comprado tus colegas* this week.

4.3. Results and analysis

Recall that the previous analysis, in Experiment 1, focused on pronoun categorization regardless of language. Here the analysis is quite the opposite, as we are specifically interested in the differences between Spanish and English. Concretely, we focus on the contrast in the properties of subject inversion in Spanish and English wh-questions and what this can tell us about Spanish subject inversion.

Table 5. Code-switching means and standard deviations for all participants

Word order	<i>M</i>	<i>SD</i>
SV	4.49	2.56
VS	2.99	2.57

As with Experiment 1, we begin by looking at just the CS data. The results for all 19 participants included in the data analysis can be seen in Table 5, including the mean ratings on a 1-7 Likert scale. These acceptability judgments are for code-switched sentences such as in (28) above.

Participants rated the SV word order near the midpoint of the scale. The VS word order was comparatively dispreferred, but the difference in acceptability between the two word orders is fairly small.⁷ Setting aside for the moment that the ratings are relatively close to the midpoint on

⁷ We refer to 'fairly small' differences, rather than using inferential statistics, for two main reasons. First, there are conceptual reasons why data from grouping all participants is problematic, so further analyzing the small difference between word orders is unnecessary. Second, as discussed in the conclusions, Experiment 1 analyses all of the participants and uses a statistical test to uncover contrasts, while Experiment 2 looks at the subset of participants with the necessary monolingual judgments. Each choice has its benefits, and we choose to not mix the choices to make for a cleaner illustration of each approach.

the scale, notice that the higher acceptability for the SV word order is exactly the opposite of what the theories we are focusing on here would predict.

Given this, it is worth exploring the source of these data, the participants. As discussed in the introduction, there are various factors that introduce variability into the language outcomes of bilingual speakers that may influence their I-language. While the source of this variability, including sociolinguistic factors, raises interesting questions, this study focuses on participants' I-language, however it came to be, as measured here by their acceptability judgments. Given the unclear and unexpected results of the CS data, and knowing the variation in bilingual speakers, it is worth examining the participants' monolingual judgments. To do so, we will focus on subsets of participants that agree on the acceptability or unacceptability of the word orders of interest here, SV and VS word orders in monolingual English and Spanish. There are various ways of operationalizing "agreement" with respect to ratings. For the sake of simplicity, we chose a simple but conservative definition where two participants "agree" if the average ratings on a given type of stimulus are either greater than or equal to 5 or less than or equal to 3 for both participants. This excluded the middle ratings between 3 and 5 where it is less clear how much agreement there is.

Crucially, the degree to which the acceptable word orders match those of the canonical word orders in each language will affect the type of analysis that can be made and the conclusions that can ultimately be drawn from these participants' CS data.

For example, it turns out that there is a group of participants ($N = 3$) that accepts both SV and VS word orders in monolingual Spanish while only accepting SV word order in monolingual English sentences. Their mean ratings can be found in Table 6.

Table 6. Inversion-optional participant group

Word order	Spanish		English	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
SV	6.00	2.00	6.58	0.79
VS	6.83	0.58	1.00	0.00

This presents a problem for using these participants' CS data, whether in isolation or as part of the CS data in Table 5, to test whether the properties of the Spanish tense head determine when subject inversion is required. The analysis we are undertaking depends specifically on a contrast in acceptable word order for the two languages. While there is a contrast in the VS word order between monolingual Spanish, with scores at ceiling, and monolingual English, with scores at floor, the SV word order is comparably acceptable in both Spanish and English for these participants, both toward the top end of the scale. That is to say, on the one hand, there is a contrast between the two languages when the subject is post-verbal, where the monolingual Spanish sentence in (30a) is acceptable but the parallel monolingual English sentence in (29b) is not.

(29) **VS word order**

- a. No recuerdo qué han comprado tus colegas esta semana.
'I don't remember what your colleagues have bought this week.'
- b. * I don't remember what have bought your colleagues this week.

On the other hand, a preverbal subject is acceptable both in a monolingual Spanish sentence, as in (30a), and a monolingual English sentence, as in (30b), for this subset of participants.

(30) **SV word order**

- a. No recuerdo qué tus colegas han comprado esta semana.
'I don't remember what your colleagues have bought this week.'
- b. I don't remember what your colleagues have bought this week.

This is problematic for the analysis. Without the contrast between Spanish and English for SV word order, it is not clear what the acceptability of SV word order in CS would say with regard to the research question. In order to support the claim that syntactic properties of the Spanish tense head determine the position of the subject, we must exclude the possibility that syntactic properties from the other language are determining the subject position. Since these participants also accept SV word order in English, there must be English syntactic properties which drive this word order in monolingual English, so we cannot exclude the possibility that this word order is acceptable in CS due to English syntactic properties.⁸

Now let us consider what happens when we analyze the data of participants who only accept SV word order in monolingual English ($N = 6$), as in (30b), but not in Spanish, as in (30a), and who only accept VS word order in monolingual Spanish, as in (29a), but not English, as in (29b). This pattern corresponds to acceptability that does not evidence cross-linguistic influences, as it parallels the monolingual judgments laid out in §4.1. Note, however, that we are not concerned here with the source of the acceptability, including from transfer, but rather the properties of the I-language in question and what we can learn from it. The remaining participants are excluded from the analysis because, like the first group above, the word orders that they accept in monolingual Spanish and English do not fully contrast in a way that would permit answering the research question.

The acceptability ratings of these participants can be found in Table 7. Notice that these

⁸ Differences between I-languages such as these raise interesting questions about the source of those differences, including potential cross-linguistic influence (cf. Myers-Scotton, 2002, and Appel & Muysken, 2006, for discussion). However, the framework adopted here focuses on the outcome (i.e., I-language), rather than the source. The crucial observation is that the I-language of these participants does not have the necessary contrast in SV word order, whatever the reason.

participants do have a more pronounced contrast in acceptability between the SV and VS word orders in CS compared to the original group of participants. From a descriptive perspective, these differences are relatively small, but knowing that the participants analyzed here have the necessary contrasts in acceptability between the two languages provides a foundation for interpreting the CS results, as argued below.

Table 7. Participants accepting only SV in Spanish and VS in English

Word order	CS		Spanish		English	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
SV	5.25	2.35	2.92	2.47	6.42	1.47
VS	2.92	2.70	5.96	1.92	1.08	0.41

Given the contrast in inversion requirements between Spanish and English for these participants and the clearer acceptability judgments, we are now in a position to answer our research question. If the syntactic properties of the Spanish tense head determine when inversion is required, and participants strongly prefer VS to SV word order in monolingual Spanish, as seen in Table 7, we would predict that inversion would be required in the parallel code-switched wh-questions as well, but this is not what we find. Instead, a code-switched sentence like (27a), repeated here as (31a), without inversion is more acceptable, and a code-switched sentence as in (31b) with inversion is less acceptable.

- (31) a. I don't remember what *tus colegas han comprado* this week.
 'I don't remember what your colleagues have bought this week.'
- b. * I don't remember what *han comprado tus colegas* this week.

Based on this small set of results, we can tentatively answer our research question, suggesting that the Spanish tense head does not in fact determine when subject inversion is required. Note that only a subset of the participants had the necessary contrasts in their monolingual acceptability judgments to answer the research question and hence only they were included in the final analysis. Isolating the effects of the syntactic features of the Spanish tense head depends on being able to link those properties to the final word order, but if the word orders do not contrast in the monolingual judgments, that link is broken. This does not mean that the CS data of the other participants could not answer different, interesting questions about wh-questions.

While these results are not definitive, for our purposes, the crucial observation is that the monolingual acceptability judgments of the participants were critical to interpreting the CS results, allowing us to isolate participants with the necessary contrast in their monolingual Spanish and English acceptability judgments.

5. Discussion and Conclusions

As we have seen, while CS can serve as a novel source of evidence regarding properties of human language, interpreting that evidence requires additional data and analysis. In particular, there are two potential issues of interpretation that we focus on here, both related to design and analysis of AJTs. In each case, by having the same bilingual participants judge both code-switched and monolingual stimuli, there are parallel monolingual acceptability judgments which can be used to address these issues.

The first potential issue of interpretation stems from the fact that CS adds an additional source of unacceptability to a given set of data. In Experiment 1, we explored the implications of this issue by investigating whether Cardinaletti and Starke's (1999) categorization of pronouns aligns with the acceptability of pronouns in Spanish-English CS. By comparing the acceptability judgments of code-switched and monolingual stimuli from the same participants, we were able to pinpoint the source of unacceptability of the unaltered pronouns, changing our interpretation of the CS data and ultimately the answer to our research question. In a sense, CS added another possible source of unacceptability but one that could only be uncovered using monolingual stimuli judged by the same participants. Depending on the framework, the source of unacceptability is not actually CS *per se*. Instead, the particular combination of syntactic features, and the principles that manipulate them, results in an unacceptable sentence, and this combination is only made possible by drawing from two languages. CS introduces this new source of acceptability by introducing new combinations of features that would not otherwise have been possible in a single language.

The second potential issue of interpretation stems from assumptions regarding the I-language of the participants being studied. In Experiment 2, the comparability of the participants was crucial to answering the research question, which asked whether syntactic properties of the Spanish tense head determine when subject inversion is required. The research question depends on a contrast between the two languages in order to be able to tease apart the role different syntactic heads play in the process of inversion. It turns out that only a subset of the participants in this experiment had the full set of contrasts which the analysis depends on. Analyzing the CS data of only these participants, there is a clear contrast in acceptability, leading us to answer the research question in the negative, suggesting that accounts of inversion in Spanish that depend principally on syntactic properties of the tense head may not fully account for inversion in Spanish *wh*-questions. If instead we analyze the CS data of all the participants, including participants lacking the necessary monolingual word order contrasts, there is a relatively small difference in acceptability between the SV and VS word orders, leaving us unable to answer the research question for both conceptual and quantitative reasons. In short, once the CS data were restricted to those participants with a comparable I-language, the CS results could be meaningfully interpreted. Note that Experiment 2 focuses on participants that show no evidence of cross-linguistic influence in their monolingual acceptability judgments, as their acceptability parallels that of monolingual speakers, but we are not arguing against using speakers with some level of cross-linguistic influence in CS research.

This very much depends on the research question and the larger aims of the study.

We have argued here for the inclusion of monolingual stimuli as part of standard practice in CS experimental design, but this still leaves open a variety of related methodological questions. For example, what kind of monolingual stimuli should be included? Though not discussed here for reasons of space, the monolingual stimuli in Experiment 2 included a few structures that were not directly tested in the CS stimuli. These were included to test assumptions regarding more general properties of wh-questions in the participants' I-language. This may be useful when the word orders under study might crucially differ in underlying structure. More generally, when attempting to ensure that participants have comparable I-languages, how do you operationalize "comparable"? (See §4.3 for some discussion.) Are thresholds or ranges in the ratings sufficient? Is a statistical analysis preferred? If so, which one?

Relatedly, there is an important contrast between the analysis for Experiment 1 and for Experiment 2 that is worth discussing in some detail. The issue centers on the crucial role that grouping participants by their agreement on monolingual judgments played in analyzing the data and answering the research question for Experiment 2. This contrasts with Experiment 1 where participants were not explicitly grouped by I-language as part of the analysis. Instead, Experiment 1 took a more traditional approach to making comparisons by applying a statistical test, an ANOVA, to the acceptability judgments of a group of background- and proficiency-matched participants.

While being well-motivated conceptually, it is worth considering some potential drawbacks to directly using monolingual judgments to control for I-language. First, as previously mentioned, there are various ways of operationalizing "agreement" between participants so as to group them by I-language. To our knowledge, there is no standard methodology for this, and different choices may produce different outcomes. In analyses such as that of Experiment 2, the operationalization of agreement is further complicated by the number of factors involved in the phenomenon under study. As the number of factors which are essential to the analysis increases, so does the number of judgments on which participants must agree. If participants must agree on all factors, this potentially greatly reduces the total number of participants that fully "agree".

In contrast, it is common practice across many subfields of linguistics to use statistical tests such as the ANOVAs in Experiment 1 to compare participants' ratings on an AJT. Importantly, by directly comparing the CS and monolingual judgments of the same participants, any sufficient disagreement between participants in their acceptability judgments should remain constant for both sets of stimuli. In other words, I-language is still accounted for but in another way.

The approaches in Experiment 1 and Experiment 2 each require certain judgment calls that will ultimately have to be justified, and it is up to the researcher to determine which of the two approaches described above best fits their analysis and data, or if they should be combined. In

Experiment 1, the properties of pronoun categorization permitted a direct comparison between parallel monolingual and code-switched sentences, so a statistical test could straightforwardly be performed, one which could make the comparison while also controlling for differences among participants. In Experiment 2, the monolingual stimuli served to establish contrasts between the two languages, but directly comparing code-switched sentences to parallel monolingual sentences would serve no purpose. The analysis of the CS data instead focused on the interaction of the properties of the two languages, where it was more crucial to establish contrasts at the level of the individual participant.

Turning our attention to the broader context of CS research, we can touch upon related literature on pronouns in CS. Although there is yet to be an all-encompassing proposal that accounts for the entirety of pronoun behavior in CS, there are numerous works that mention the restrictions against a code-switch between a pronoun and a finite verb (Gumperz, 1977; Lipski, 1978; Timm, 1975; among others), and at least a couple that provide evidence that, in at least some contexts, pronouns can be code-switched (Jake, 1994; van Gelderen & MacSwan, 2008). Interestingly, none of these works makes mention of the status of monolingual structures regarding pronoun behavior. In addition, none are lab-based experiments either, as they rely on consultant data or exemplars previously reported in the literature. Given this methodological difference, the concern presented here is not immediately relevant. However, it is worth pointing out that the reported constructions where pronouns are acceptably switched—hanging topics (Jake, 1994) and coordination (van Gelderen & MacSwan 2008)—were shown in Experiment 1 to include variability with regard to monolingual acceptability. Therefore, although there may not be a direct impact on non-experimental CS research, the issue at hand, i.e. monolingual variability, could be present regardless of the methodological approach. Given that what these structures look like monolingually for those speakers is left unaddressed, we have to assume some sort of homogeneity, which could very well be inaccurate. In addition to encouraging a direct change to lab-based CS research by including monolingual stimuli, we hope there will be a continued conversation about monolingual variability throughout the field, including naturalistic and consultant data.

Regarding subject inversion in *wh*-questions, there are three principle studies that look at inversion in CS, Woolford (1984), D’Introno (1996) and Toribio and González-Vilbazo (2014). Of those, only the latter makes a proposal using the Minimalist approach to CS adopted in this paper. The tense head plays a crucial role in the proposal, but CS data presented here suggest that the locus of features triggering inversion lies in another functional head, such as the complementizer (Buesa-García, 2008) or the *wh*-phrase (Torrego, 1984; Woolford, 1984). Thus, our CS results suggest that further work on subject inversion in code-switched *wh*-questions is required to pinpoint the relevant functional head (cf. Ebert, 2014, for some discussion).

Moving away from the two phenomena under investigation here, there is a growing body of literature regarding experimental work on CS. Broadly speaking, almost none of it includes

monolingual judgments from participants. González-Vilbazo et al. (2013) do explicitly mention controlling for dialectal differences in either language with regard to participant selection, but in terms of actual data collection, the focus seems to be exclusively on CS. We do not wish to argue, though, that CS data collected in isolation is never an option. For a recent example, Giancaspro (2015) investigates a number of different restrictions on Spanish-English CS, comparing the judgments of heritage speakers and second language learners. Included in the experiment are stimuli with the familiar pronoun vs. lexical DP distinction, as well as a less clear contrast in acceptability, a switch between the auxiliary and the verb. At no point did participants rate monolingual sentences. Nonetheless, the specific versions of these structures used in the experiment itself are not particularly controversial. Unlike Experiment 1, the pronouns included were all canonical subject pronouns (i.e., not coordinated, modified, etc.). In such a case, monolingual stimuli would not produce any revelatory information, as it can be safely assumed that all participants overlap in their use of common subject pronouns. However, had the experiment included auxiliary-verb switches that were presented as an interrogative, for example, monolingual stimuli would be essential. As illustrated previously with the *wh*-movement stimuli in Experiment 2, a similar assumption or participant overlap would not be possible.

Returning to the general issue of methodological considerations in CS research, we have seen that, in addition to the many concerns relevant for any experimental research, the particular properties of CS introduce a number of additional concerns. Here we reviewed two specific concerns using concrete examples of the effect these issues could have on the interpretation of CS data, and we found that monolingual acceptability judgments allowed us to avoid the issues. This adds to the broader discussion of best practices in experimental code-switching methods, particularly those focused on grammatical aspects of CS such as those explored in Toribio (2001a), MacSwan and McAlister (2010), and González-Vilbazo et al. (2013). In particular, the current work expands on the notion that project design presents unique challenges when investigating CS data.

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Appendix

Experiment 1 Stimuli

Code-switching

Unaltered English pronoun

He duerme durante el día.
He trabaja muy duro.
She escribe muy rápido.
She estudia en la biblioteca.

Unaltered Spanish pronoun

Él sleeps during the day.
Él works very hard.
Ella studies at the library.
Ella writes very quickly.

Modified English pronoun

Her with the blonde hair estudia en la biblioteca.
Her with the brown eyes escribe muy rápido.
Him with the black hair duerme durante el día.
Him with the blue eyes trabaja muy duro.

Modified Spanish pronoun

Él con el pelo negro sleeps during the day.
Él con los ojos azules works very hard.
Ella con el pelo rubio studies at the library.
Ella con los ojos marrones writes very quickly.

Coordinated English pronoun

He and Alex duermen durante el día.
He and Charlie trabajan muy duro.
She and Bonnie estudian en la biblioteca.
She and Daphne escriben muy rápido.

Coordinated Spanish pronoun

Él y Alberto sleep during the day.
Él y Carlos work very hard.
Ella y Beatriz study at the library.
Ella y Diana write very quickly.

Cleft English pronoun

Eduardo dijo que es him that sleeps during the day.
Francisca dijo que es her that studies at the library.
Guillermo dijo que es him that works very hard.
Isabel dijo que es her that writes very quickly.

Cleft Spanish pronoun

Evan said it's él que duerme durante el día.
Franny said it's ella que estudia en la biblioteca.
Greg said it's él que trabaja muy duro.
Ingrid said it's ella que escribe muy rápido.

Hanging topic English pronoun

Jennifer said that him, duerme durante el día.
Leonard said that her, estudia en la biblioteca.
Melissa said that him, trabaja muy duro.
Nathaniel said that her, escribe muy rápido.

Hanging topic Spanish pronoun

Juanita dijo que él, he sleeps during the day.
Luis dijo que ella, she studies at the library.
Manuela dijo que él, he works very hard.
Nicolás dijo que ella, she writes very quickly.

Prosodically-stressed English pronoun

He studies at home, but SHE estudia en la biblioteca.
He writes very slowly, but SHE escribe muy rápido.
She is lazy, but HE trabaja muy duro.
She sleeps at night, but HE duerme durante el día.

Prosodically-stressed Spanish pronoun

Él escribe muy lento, pero ELLA writes very quickly.
Él estudia en casa, pero ELLA studies at the library.
Ella duerme durante la noche, pero ÉL sleeps during the day.
Ella es perezosa, pero ÉL works very hard.

Monolingual English

Unaltered English pronoun

He sleeps during the day.
He works very hard.
She studies at the library.
She writes very quickly.

Modified English pronoun

Her with the blonde hair studies at the library.
Her with the brown eyes writes very quickly.
Him with the black hair sleeps during the day.
Him with the blue eyes works very hard.

Coordinated English pronoun

He and Alex sleep during the day.
He and Charlie work very hard.
She and Bonnie study at the library.
She and Daphne write very quickly.

Cleft English pronoun

Evan said it's him that sleeps during the day.
Franny said it's her that studies at the library.
Greg said it's him that works very hard.
Ingrid said it's her that writes very quickly.

Hanging topic English pronoun

Jennifer said that him, he sleeps during the day.
Leonard said that her, he studies at the library.

Melissa said that him, he works very hard.
Nathaniel said that her, she writes very quickly.

Prosodically-stressed English pronoun

He studies at home, but SHE studies at the library.
He writes very slowly, but SHE writes very quickly.
She is lazy, but HE works very hard.
She sleeps at night, but HE sleeps during the day.

Monolingual Spanish

Unaltered Spanish pronoun

Él duerme durante el día.
Él trabaja muy duro.
Ella escribe muy rápido.
Ella estudia en la biblioteca.

Modified Spanish pronoun

Él con el pelo negro duerme durante el día.
Él con los ojos azules trabaja muy duro.
Ella con el pelo rubio estudia en la biblioteca.
Ella con los ojos marrones escribe muy rápido.

Coordinated Spanish pronoun

Él y Alberto duermen durante el día.
Él y Carlos trabajan muy duro.
Ella y Beatriz estudian en la biblioteca.
Ella y Diana escriben muy rápido.

Cleft Spanish pronoun

Eduardo dijo que es él que duerme durante el día.
Francisca dijo que es ella que estudia en la biblioteca.
Guillermo dijo que es él que trabaja muy duro.
Isabel dijo que es ella que escribe muy rápido.

Hanging topic Spanish pronoun

Juanita dijo que él, duerme durante el día.
Luis dijo que ella, estudia en la biblioteca.
Manuela dijo que él, trabaja muy duro.
Nicolás dijo que ella, escribe muy rápido.

Prosodically-stressed Spanish pronoun

Él escribe muy lento, pero ELLA escribe muy rápido.
Él estudia en casa, pero ELLA estudia en la biblioteca.
Ella duerme durante la noche, pero ÉL duerme durante el día.
Ella es perezosa, pero ÉL trabaja muy duro.

Experiment 2 Stimuli

Code-switching

Matrix wh-questions with complex wh-phrases

- Cuántas blusas your nieces have bought este otoño?
- Cuántas papas fritas those guys have eaten desde que llegaron?
- Cuántos poemas your sisters have written este mes?
- Cuántos cables those employees have stolen en el trabajo?
- How many blouses tus sobrinas han comprado this fall?
- How many french fries esos muchachos han comido since they arrived?
- How many poems tus hermanas han escrito this month?
- How many cables esos empleados han robado at work?
- Cuántas blusas have your nieces bought este otoño?
- Cuántas papas fritas have those guys eaten desde que llegaron?
- Cuántos poemas have your sisters written este mes?
- Cuántos cables have those employees stolen en el trabajo?
- How many blouses han tus sobrinas comprado this fall?
- How many french fries han esos muchachos comido since they arrived?
- How many poems han tus hermanas escrito this month?
- How many cables han esos empleados robado at work?
- Cuántas blusas have bought your nieces este otoño?
- Cuántas papas fritas have eaten those guys desde que llegaron?
- Cuántos poemas have written your sisters este mes?
- Cuántos cables have stolen those employees en el trabajo?
- How many blouses han comprado tus sobrinas this fall?
- How many french fries han comido esos muchachos since they arrived?
- How many poems han escrito tus hermanas this month?
- How many cables han robado esos empleados at work?

Matrix wh-questions with simple wh-phrases

- Qué those kids have bought en el centro comercial hasta ahora?
- Qué those workers have eaten en los últimos cuatro días?
- Qué your classmates have written desde que se asignó la tarea?
- Qué your neighbors have stolen mientras no estabas?
- What esos niños han comprado at the mall so far?
- What esos trabajadores han comido in the last four days?
- What tus compañeros han escrito since the homework was assigned?
- What tus vecinos han robado while you weren't there?
- Qué have those kids bought en el centro comercial hasta ahora?
- Qué have those workers eaten en los últimos cuatro días?
- Qué have your classmates written desde que se asignó la tarea?
- Qué have your neighbors stolen mientras no estabas?
- What han esos niños comprado at the mall so far?
- What han esos trabajadores comido in the last four days?

What han tus compañeros escrito since the homework was assigned?

What han tus vecinos robado while you weren't there?

Qué have bought those kids en el centro comercial hasta ahora?

Qué have eaten those workers en los últimos cuatro días?

Qué have written your classmates desde que se asignó la tarea?

Qué have stolen your neighbors mientras no estabas?

What han comprado esos niños at the mall so far?

What han comido esos trabajadores in the last four days?

What han escrito tus compañeros since the homework was assigned?

What han robado tus vecinos while you weren't there?

Embedded wh-questions with complex wh-phrases

I don't remember how many beers those students han comprado en la última hora.

No recuerdo how many apples your children han comido desde el domingo.

I don't remember how many articles those researchers han escrito este semestre.

No recuerdo how much money those criminals han robado en la última década.

I don't remember cuántas cervezas those students have bought en la última hora.

No recuerdo cuántas manzanas your children have eaten desde el domingo.

I don't remember cuántos artículos those researchers have written este semestre.

No recuerdo cuánto dinero those criminals have stolen en la última década.

I don't remember how many beers esos estudiantes han comprado in the last hour.

No recuerdo how many apples tus hijos han comido since Sunday.

I don't remember how many articles esos investigadores han escrito this semester.

No recuerdo how much money esos delincuentes han robado in the last decade.

I don't remember cuántas cervezas esos estudiantes have bought in the last hour.

No recuerdo cuántas manzanas tus hijos have eaten since Sunday.

I don't remember cuántos artículos esos investigadores have written this semester.

No recuerdo cuánto dinero esos delincuentes have stolen in the last decade.

I don't remember how many beers han comprado those students en la última hora.

No recuerdo how many apples han comido your children desde el domingo.

I don't remember how many articles han escrito those researchers este semestre.

No recuerdo how much money han robado those criminals en la última década.

I don't remember cuántas cervezas have bought those students en la última hora.

No recuerdo cuántas manzanas have eaten your children desde el domingo.

I don't remember cuántos artículos have written those researchers este semestre.

No recuerdo cuánto dinero have stolen those criminals en la última década.

I don't remember how many beers han comprado esos estudiantes in the last hour.

No recuerdo how many apples han comido tus hijos since Sunday.

I don't remember how many articles han escrito esos investigadores this semester.

No recuerdo how much money han robado esos delincuentes in the last decade.

I don't remember cuántas cervezas have bought esos estudiantes in the last hour.

No recuerdo cuántas manzanas have eaten tus hijos since Sunday.

I don't remember cuántos artículos have written esos investigadores this semester.

No recuerdo cuánto dinero have stolen esos delincuentes in the last decade.

Embedded wh-questions with simple wh-phrases

I don't remember what your colleagues han comprado esta semana.

No recuerdo what those rabbits han comido desde que planté el jardín.

I don't remember what your cousins han escrito desde que se graduaron de la universidad.

No recuerdo what those bankers han robado desde la última crisis económica.

I don't remember qué your colleagues have bought esta semana.

No recuerdo qué those rabbits have eaten desde que planté el jardín.

I don't remember qué your cousins have written desde que se graduaron de la universidad.

No recuerdo qué those bankers have stolen desde la última crisis económica.

I don't remember what tus colegas han comprado this week.

No recuerdo what esos conejos han comido since I planted the garden.

I don't remember what tus primos han escrito since graduating from college.

No recuerdo what esos banqueros han robado since the last economic crisis.

I don't remember qué tus colegas have bought this week.

No recuerdo qué esos conejos have eaten since I planted the garden.

I don't remember qué tus primos have written since graduating from college.

No recuerdo qué esos banqueros have stolen since the last economic crisis.

I don't remember what han comprado your colleagues esta semana.

No recuerdo what han comido those rabbits desde que planté el jardín.

I don't remember what han escrito your cousins desde que se graduaron de la universidad.

No recuerdo what han robado those bankers desde la última crisis económica.

I don't remember qué have bought your colleagues esta semana.

No recuerdo qué have eaten those rabbits desde que planté el jardín.

I don't remember qué have written your cousins desde que se graduaron de la universidad.

No recuerdo qué have stolen those bankers desde la última crisis económica.

I don't remember what han comprado tus colegas this week.

No recuerdo what han comido esos conejos since I planted the garden.

I don't remember what han escrito tus primos since graduating from college.

No recuerdo what han robado esos banqueros since the last economic crisis.

I don't remember qué have bought tus colegas this week.

No recuerdo qué have eaten esos conejos since I planted the garden.

I don't remember qué have written tus primos since graduating from college.

No recuerdo qué have stolen esos banqueros since the last economic crisis.

Monolingual Spanish

Matrix wh-questions with complex wh-phrases

Cuántas blusas tus sobrinas han comprado este otoño?

Cuántas papas fritas esos muchachos han comido desde que llegaron?

Cuántos poemas tus hermanas han escrito este mes?

Cuántos cables esos empleados han robado en el trabajo?

Cuántas blusas han tus sobrinas comprado este otoño?

Cuántas papas fritas han esos muchachos comido desde que llegaron?

Cuántos poemas han tus hermanas escrito este mes?

Cuántos cables han esos empleados robado en el trabajo?

Cuántas blusas han comprado tus sobrinas este otoño?

Cuántas papas fritas han comido esos muchachos desde que llegaron?

Cuántos poemas han escrito tus hermanas este mes?

Cuántos cables han robado esos empleados en el trabajo?

Matrix wh-questions with simple wh-phrases

Qué esos niños han comprado en el centro comercial hasta ahora?

Qué esos trabajadores han comido en los últimos cuatro días?

Qué tus compañeros han escrito desde que se asignó la tarea?

Qué tus vecinos han robado mientras no estabas?

Qué han esos niños comprado en el centro comercial hasta ahora?

Qué han esos trabajadores comido en los últimos cuatro días?

Qué han tus compañeros escrito desde que se asignó la tarea?

Qué han tus vecinos robado mientras no estabas?

Qué han comprado esos niños en el centro comercial hasta ahora?

Qué han comido esos trabajadores en los últimos cuatro días?

Qué han escrito tus compañeros desde que se asignó la tarea?

Qué han robado tus vecinos mientras no estabas?

Embedded wh-questions with complex wh-phrases

No recuerdo cuántas cervezas esos estudiantes han comprado en la última hora.

No recuerdo cuántas manzanas tus hijos han comido desde el domingo.

No recuerdo cuántos artículos esos investigadores han escrito este semestre.

No recuerdo cuánto dinero esos delincuentes han robado en la última década.

No recuerdo cuántas cervezas han comprado esos estudiantes en la última hora.

No recuerdo cuántas manzanas han comido tus hijos desde el domingo.

No recuerdo cuántos artículos han escrito esos investigadores este semestre.

No recuerdo cuánto dinero han robado esos delincuentes en la última década.

Embedded wh-questions with simple wh-phrases

No recuerdo qué tus colegas han comprado esta semana.

No recuerdo qué esos conejos han comido desde que planté el jardín.

No recuerdo qué tus primos han escrito desde que se graduaron de la universidad.

No recuerdo qué esos banqueros han robado desde la última crisis económica.

No recuerdo qué han comprado tus colegas esta semana.

No recuerdo qué han comido esos conejos desde que planté el jardín.

No recuerdo qué han escrito tus primos desde que se graduaron de la universidad.

No recuerdo qué han robado esos banqueros desde la última crisis económica.

Additional Monolingual Stimuli (Testing position of auxiliary)

Esos estudiantes jamás han terminado el examen.

Susana todavía estudia historia del arte.

Mi vecino nunca ha corrido por las tardes.

Yo sencillamente no aguanto a ese mocoso.

¿A quién jamás has ofendido tú con tus acciones?

¿Qué idioma todavía estudia Pepita en su tiempo libre?

¿Dónde nunca ha corrido tu hermana?

¿A cuál de esos mocosos sencillamente no aguantas?

Monolingual English

Matrix wh-questions with complex wh-phrases

How many blouses your nieces have bought this fall?

How many french fries those guys have eaten since they arrived?

How many poems your sisters have written this month?

How many cables those employees have stolen at work?

How many blouses have your nieces bought this fall?

How many french fries have those guys eaten since they arrived?

How many poems have your sisters written this month?

How many cables have those employees stolen at work?

How many blouses have bought your nieces this fall?

How many french fries have eaten those guys since they arrived?

How many poems have written your sisters this month?

How many cables have stolen those employees at work?

Matrix wh-questions with simple wh-phrases

What those kids have bought at the mall so far?

What those workers have eaten in the last four days?

What your classmates have written since the homework was assigned?

What your neighbors have stolen while you weren't there?

What have those kids bought at the mall so far?

What have those workers eaten in the last four days?

What have your classmates written since the homework was assigned?

What have your neighbors stolen while you weren't there?

What have bought those kids at the mall so far?

What have eaten those workers in the last four days?

What have written your classmates since the homework was assigned?

What have stolen your neighbors while you weren't there?

Embedded wh-questions with complex wh-phrases

I don't remember how many beers those students have bought in the last hour.

I don't remember how many apples your children have eaten since Sunday.
I don't remember how many articles those researchers have written this semester.
I don't remember how much money those criminals have stolen in the last decade.
I don't remember how many beers have bought those students in the last hour.
I don't remember how many apples have eaten your children since Sunday.
I don't remember how many articles have written those researchers this semester.
I don't remember how much money have stolen those criminals in the last decade.
I don't remember how many beers have those students bought in the last hour.
I don't remember how many apples have your children eaten since Sunday.
I don't remember how many articles have those researchers written this semester.
I don't remember how much money have those criminals stolen in the last decade.

Embedded wh-questions with simple wh-phrases

I don't remember what your colleagues have bought this week.
I don't remember what those rabbits have eaten since I planted the garden.
I don't remember what your cousins have written since graduating from college.
I don't remember what those bankers have stolen since the last economic crisis.
I don't remember what have bought your colleagues this week.
I don't remember what have eaten those rabbits since I planted the garden.
I don't remember what have written your cousins since graduating from college.
I don't remember what have stolen those bankers since the last economic crisis.
I don't remember what have your colleagues bought this week.
I don't remember what have those rabbits eaten since I planted the garden.
I don't remember what have your cousins written since graduating from college.
I don't remember what have those bankers stolen since the last economic crisis.

Additional Monolingual Stimuli (Testing naturalness of V2 in embedded contexts)

I found out how did they get into the building.
I usually know who might they hire.
I remember clearly how many people did they arrest.
The police discovered who had they beaten up.
You'd be better off asking why did he marry me.
I asked him from what source could the reprisals come.
I wonder what is he like.
The baritone was asked what did he think of Mrs Kearney's conduct.
You'd be better off asking why he married me.
I asked him from what source the reprisals could come.
I wonder what he is like.
The baritone was asked what he thought of Mrs Kearney's conduct.

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