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On the position of subjects in Spanish: Evidence from code-switching

RESEARCH

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Abstract

Some languages have a fixed subject position, while others are more flexible. Languages like English require pre-verbal subjects; languages like Spanish allow subjects in post-verbal position. Because this difference clusters with several linguistic properties distinguishing the two languages, subjects in Spanish and English have been a perennial issue in linguistic theory, touching central problems like the EPP, the nature of cross-linguistic variation, and the relationship between core functional heads. Our project contributes a novel source of evidence to these debates: Spanish/English code-switching. Code-switching, the use of two languages in one utterance, combines the languages' lexical items and their attendant syntactic features in a single derivation. Because code-switching, like all natural language, is rule-governed, researchers can exploit judgments about the well-formedness of code-switched sentences to draw conclusions about the combinations of features they represent. We report on a formal judgment experiment testing subject position in Spanish/English code-switching as a function of the presence of two functional heads known (from monolingual evidence) to affect subject placement: the C(omplementizer) and T(ense) heads. By manipulating which head appears in which language, we test the availability of post-verbal subjects under different feature combinations. Our results show that post-verbal subjects are only available when both C and T are in Spanish; neither Spanish head alone is sufficient. This finding suggests that the features regulating subject position stem from neither head alone, which is problematic for traditional approaches to the EPP as a feature of T but in line with other recent research on null subjects.

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1 The problem: Spanish subjects and the EPP

The fact that languages differ in whether and under what conditions they require pre-verbal subjects has been a perennial issue in linguistic theory, encompassing debates about subject-verb inversion, expletives, subjects' syntactic properties, and null subjects. Spanish, an SVO language which nonetheless allows subjects to appear in post-verbal position fairly freely, has been a key source of evidence in these debates. In typologies, Spanish—along with other Romance languages like Italian, European Portuguese, and Catalan, plus Hungarian, Quechua, Greek, Arabic, Hausa, and many others—is classified as a *consistent null-subject language* (Holmberg 2005). One reason that such languages are so intriguing to linguists is that many apparently unrelated linguistic facts cluster together in them. The properties listed in (1) have been claimed to pertain to consistent null-subject languages like Spanish (Barbosa 2011; Camacho 2013).

(1) Properties of consistent null-subject languages
- a. Subjects can be phonologically null without regard to clause type or subject person/number
- b. **Subjects can appear in post-verbal position (so-called "free inversion")**,
- c. Pre-verbal subjects tend to be topics (while post-verbal topics tend to be foci) and reflect the syntactic properties of topics
- d. Subjects can be extracted from subordinate clauses over a complementizer (that is, lack of the *that*-trace effect)
- e. Verbs have 'rich' subject agreement morphology

These properties contrast with those of *non-null-subject languages*, like English, German, French, and Mainland Scandinavian. In such languages, overt subjects are obligatory and obligatorily appear in pre-verbal position. Our focus in this paper is property (1b): the availability of post-verbal subjects in some languages, like Spanish, but not in others, like English.

To explain the different behavior of subjects in Spanish and English, early generative theory appealed to the *pro-drop parameter*, and the requirement that the subject position be filled in languages like English took the form of the Extended Projection Principle (EPP). Under the Minimalist Program (Chomsky 1995 et seq.), the locus of cross-linguistic differences shifted from parameters to the features of lexical items; the difference between languages like Spanish and those like English stems from the formal features on the relevant functional heads. Under this approach, the EPP has been understood as a property of the T(ense) head, since pre-verbal subjects are generally assumed to move to the Specifier of the Tense Phrase (Spec,TP).[1] That is, what makes Spanish different from English is that the English lexicon contains a functional head T with EPP features, while the Spanish lexicon contains a T head without such features. Yet this formulation remains unsatisfactory to many. The EPP has long struck linguists as an inelegant stipulation—Chomsky (2008: 156) calls it "an annoying problem ever since it was originally formulated"—and there have been calls to eliminate it from theories of grammar (Bošković 2007), attempts to rethink it as a prosodic restriction (N. Richards 2016; McFadden & Sundaresan 2018), and substantial debate about its status in null-subject languages like Spanish.

We aim to contribute novel evidence to this debate using experimental data from Spanish/English code-switching, which is the use of two or more languages in a single utterance, as in (2).[2,3]

(2) **My friend** bought *un ornitorrinco como mascota.* English/*Spanish*
a platypus as pet
'My friend bought a platypus as a pet.'

Code-switching is common in bilingual communities and is rule-governed like all other manifestations of natural language. Code-switching is an instantiation of a bilingual's I-language, just as their monolingual utterances are, and, just as some monolingual sentences

1 This functional head is sometimes called I(nfl) or AgrS; we adopt the label T for ease of exposition.

2 In other contexts, the term "code-switching" can refer to changing one's speech due to social context, generally within a single language, sometimes involving switching dialects or registers.

3 By convention, in examples we italicize one language for clarity. In this case, Spanish appears in italics and English in roman. We render subjects in boldface to facilitate their identification.

are impossible due to the featural requirements of the lexical items involved, code-switched sentences reflect the features of the lexical items that compose them (MacSwan 1999; 2013). What makes code-switching special is that it is possible to combine lexical items from more than one language in a single derivation, which allows us to observe combinations of features that may not otherwise be possible (González-Vilbazo & López 2012; González-Vilbazo et al. 2013). In this way, code-switching serves as a microscope of sorts, one we use to peer more closely at the properties of subjects in Spanish and English. To put our microscope to use, we carried out an experiment in which we examined the availability of pre- and post-verbal subjects, one of the key properties that differentiates null-subject from non-null-subject languages, in Spanish/English code-switching. Previewing our results, we find evidence supporting the idea that the EPP is not a property of the T head alone, but rather also involves a contribution from the C head, which is contrary to traditional formulations of the EPP but has been found previously in other experiments. To set up the experiment, we review the details of debates around the EPP in Spanish in §2 and the code-switching evidence in §3. §4 presents the current study's objectives and §5 its methods. §6 presents the results and §7 their implications.

2 Subjects in Spanish, the EPP, T, and C

The canonical word order in Spanish is subject-verb-object, and in any sentence a subject may be overtly realized in preverbal position, as in (3), just like in the equivalent English sentence (4).

(3) ***Lori*** *compró un ornitorrinco como mascota.*
Lori bought a platypus as pet
'Lori bought a platypus as a pet.'

(4) **Lori** bought a platypus as a pet.

However, Spanish subjects can appear after the verb under appropriate conditions, as in (5a), unlike the English equivalent (5b).

(5) Context: Who sold her a platypus?
a. *Se lo vendió* ***un hombre misterioso con acento australiano.***
her.DAT it.ACC sold a man mysterious with accent Australian
'A mysterious man with an Australian accent sold it to her.'
b. *Sold it to her **a mysterious man with an Australian accent**.

The availability of a post-verbal subject position is a key feature of consistent null-subject languages like Spanish, while English's requirement that the pre-verbal subject position be filled is the classic example of the EPP. As discussed in §1, under current Minimalist assumptions, the difference between these two languages stems from the feature specifications of some functional head in each language's lexicon, but debates about the nature and status of the EPP in Spanish remain unresolved. Villa-García (2018) provides an excellent overview of current theoretical proposals concerning subjects in Spanish, from which we draw heavily here, and he identifies two main approaches.

The first possibility is that Spanish does have a property like the EPP that requires the subject position be filled, but it can be filled by a phonetically null pronoun *pro* (Contreras 1991) or by a normal pronoun that is subsequently deleted via ellipsis (Barbosa 2019). Under this view, when Spanish subjects are 'null,' in fact a pronoun is present in the traditional pre-verbal subject position in Spec,TP, satisfying the EPP, which is a feature of T. If so, Spanish T is like English T; what's different is the existence of the phonologically null lexical item *pro* or the availability of a post-syntactic ellipsis operation that affects subject pronouns.

While the proposal that Spec,TP is filled with a null/elided pronoun may account for null subjects, how does it fit with post-verbal subjects? If *pro* can be an expletive, post-verbal subjects can be understood to remain in their base-generated position (Rizzi 1982), which we

will assume is Spec,*v*P.[4] The EPP feature on T is satisfied by the expletive *pro*, but this proposal requires postulating a null expletive, which is both semantically and phonetically vacuous, which some linguists find unappealing (Barbosa 2019). Alternatively, under the ellipsis model, all subjects move to Spec,TP, and then either an additional movement of some sort is required or ellipsis targets the higher copy, leaving the lower, in-situ copy to be pronounced (Villa-García 2013).

The second option is to eliminate the notion of *pro* and instead argue that 'rich' verb morphology suffices to mark the subject. This proposal stems from Alexiadou and Anagnostopoulou's (1998) influential argument in favor of a parameterized EPP (see Jelinek 1984; Ordóñez & Treviño 1999; Barbosa 2009, among others, for similar proposals). Under this view, T always has an EPP feature that must be satisfied, but languages differ in what features may satisfy it. What makes Spanish different from English is not the existence of a null pronoun (or ellipsis), but rather that in Spanish the EPP feature on T can be satisfied by the rich agreement morphology on the verb, which instantiates the relevant subject-like features. It is independently true that Spanish verbs raise to T, unlike English verbs (Villa-García 2018), so when the verb raises to T, the EPP feature of T is satisfied and no pre-verbal subject is needed. English verbs, on the other hand, lack the features necessary to satisfy the EPP, so the pre-verbal subject is necessary.

How does this approach treat post-verbal subjects? Fairly simply: under Alexiadou & Anagnastopoulou's proposal that the EPP is satisfied by verb movement, subjects can stay in Spec,*v*P because the verb raised, satisfying the EPP that way. (Pre-verbal subjects come about when the subject is also a topic and occupies a higher projection for discourse reasons.)

Both of these proposals assume that the EPP is active in Spanish, but they differ in whether it must be satisfied via agreement with a constituent in Spec,TP or via head movement of the verb to T. In both, the EPP is fundamentally a feature of the T head.

Bound up in these proposals is another, partially orthogonal, issue: whether pre-verbal Spanish subjects are even in the Spec,TP position. Subjects in Spanish have many hallmarks of A-bar-movement (see Camacho 2006 for details). This has led some to propose that these subjects are in fact hosted in a higher projection than Spec,TP, much like topics (e.g., Olarrea 1998; Ordóñez & Treviño 1999). If it is true that Spanish subjects are not in Spec,TP even when overt, it weakens the case for approaches to null subjects that assume that T possesses an EPP feature requiring Spec,TP to be filled. Sheehan (2016), using syntactic tests distinguishing A-bar-movement from A-movement, concludes Spanish "subjects can occupy a preverbal A-position, but can also raise directly from a post-verbal A-position to a preverbal A-bar position, licensing parasitic gaps, at least for some speakers. This suggests that a revised version of [Alexiadou and Anagnostopoulou's parameterized EPP] is necessary for these languages whereby the EPP can be satisfied by either XP or head-movement" (Sheehan 2016: 365). Villa-García (2018) similarly notes the evidence for and against proposals that Spanish subjects surface in Spec,TP, Spec,CP/Spec,TopicP, both positions, and other ideas, noting that these debates are still the subject of active research.

Debates about *pre*-verbal subjects have two implications for *post*-verbal subjects. First, if at least some of the time a subject can raise from its initial A-position (i.e., Spec,*v*P) directly to some A-bar position in the left periphery like Spec,CP/Spec,TopicP (or be directly merged there), then it is possible to leave Spec,TP unfilled. This points away from formulations of the EPP that require agreement between T and its specifier. Second, taking pre-verbal Spanish subjects to be in Spec,CP or a topic position suggests a role for a functional head in the C domain, beyond the role played by T. That is, it suggests that C, and not only the EPP feature on T, may be involved in determining the distribution of Spanish subjects.

4 Some advance other initial Merge sites for subjects, such as VoiceP (Kratzer 1996), but we will assume that all subjects of transitive verbs are base-generated in *v*P, although nothing hinges on this assumption. Additionally as Villa-García (2018: 344) notes, "[g]iven the diversity of constructions which allow postverbal subjects, it is not surprising that there are multiple analyses of postverbal subjects in the literature," and for the same reason it seems plausible that not all post-verbal subjects share the same syntactic position. Nevertheless, the simplest assumption, in our view, is that post-verbal subjects in Spanish simply remain in Spec,*v*P, and that is the assumption we carry forward.

It is not only the topic-like properties of Spanish subjects that suggest a role for C. Pesetsky and Torrego (2001), noting that some features distinguishing null-subject languages from non-null-subject languages—such as the existence of the *that*-trace effect and *whether*-islands—involve complementizers, proposed that what fundamentally distinguishes languages like English from languages like Spanish is the features of the C head. In their system, English C is always phonologically null, so what is pronounced as *that* is the result of head movement of T to C, whereas Spanish *que* is a true complementizer. From this setup, they derive the main differences in the distribution and behavior of subjects in the two languages. Pesetsky and Torrego's approach thus locates the difference between Spanish and English on the C head rather than on the T head while foregrounding the interaction between the two.

A similar approach—emphasizing how these two core functional heads interact—has emerged to explain a number of other facts. With the introduction of phases into Minimalism, Chomsky (2001) proposed that uninterpretable formal features, including the EPP and phi-features, originate not from their apparent source in T but from the *phase head*, which in this case is C. Under this view, T gains its features from C. This relationship, called *Feature Inheritance* (FI), is also suggested by shared properties between C and T, including tense and phi-feature agreement on C in some languages (see van Koppen 2017), as well as evidence that the form of T depends on C (e.g., a non-finite C in English results in a lack of phi-features on T). Chomsky thus takes a case like (6) to be an example in which T is present in the subordinate clause (the auxiliary *have* is the T head), but, without a C head to select it, it has no tense or phi-features, thus appearing in the infinitive. Contrast that with (7), where the auxiliary agrees with the subject.

(6) Kalyani believes Lori to have bought a platypus.

(7) Kalyani believes that Lori has bought a platypus.

Chomsky (2008: 143) fleshes out the idea of FI, claiming that "…for T, phi-features and Tense appear to be derivative, not inherent: basic tense and also tense-like properties (e.g., irrealis) are determined by C.… In the lexicon, T lacks these features. T manifests the basic tense features if and only if it is selected by C (default agreement aside); if not, it is a raising (or ECM) infinitival, lacking phi-features and basic tense." Under this formulation, FI happens between phase heads and their complements when the phase head is merged, and all syntactic operations occur at once, in parallel, due to features of the phase head. In the case of C and T, the merge of C is what provides EPP and phi-features to T, motivating the movement of the subject to Spec,TP.

Like the EPP, FI has been the subject of lively debate. For example, Richards (2007) presented conceptual arguments for the necessity of FI, but den Dikken (2014) criticized the concept as being motivated merely by theory-internal concerns. Many other scholars have proposed reformulations of the details of FI (Ouali 2008; Biberauer & Roberts 2009; Gallego 2014; Broekhuis 2016; Shim 2016). What all these approaches share is that they assume a close connection between C and T, in which, by some mechanism, features are shared between the heads. For our purposes, that means that investigating the EPP feature of T necessarily means considering the role of C because the features of the two heads may not be separable, and the difference between Spanish and English may well be a difference in the feature specification of C.

3 Code-switching evidence

3.1 Code-switching as evidence for linguistic theory

It has long been recognized that intrasentential code-switching is systematic and principle-governed, like language itself (Gingràs 1974; Timm 1975; Pfaff 1979). While even early syntactic work recognized that this systematicity can be accounted for without CS-specific rules or constraints (e.g., Pfaff 1979), MacSwan (1999), taking advantage of the possibilities afforded by the Minimalist Program (Chomsky 1995), was the first to implement such an account. In this view, code-switched sentences are generated using the same mechanisms as monolingual

sentences, and any apparent constraints emerge from the interaction of the two languages' lexical items, with their respective syntactic features, in the syntactic derivation.[5] In other words, code-switching is simply one expression of a speaker's linguistic competence, resulting from normal syntactic assumptions.

One important consequence of this approach to code-switching is that we can use it as a tool of linguistic analysis. If we assume that cross-linguistic syntactic variation stems from differences in the formal features on functional heads, we can take advantage of these differences to isolate those features (González-Vilbazo & López 2012; González-Vilbazo et al. 2013). Each language's functional heads will reflect a particular combination of formal features, so we can use the language of the heads as an index to that feature combination. This, in turn, allows us to correlate changes in acceptability with the presence of particular functional heads (and their features).

3.2 Hypotheses on word order from code-switching research

Taking the above approach, code-switching researchers have also made proposals about how word order is determined in the extended verbal projection, which this section presents. First, though, it is worth noting that some (e.g., González-Vilbazo 2005) have contended that switches between C and T are not possible in general. However, such switches are accepted in judgments (Ebert & Hoot 2018; Sande 2018; Vanden Wyngaerd 2020) and attested (though rare) in corpora (Sankoff & Poplack 1981; Mahootian & Santorini 1996; Callahan 2004; Hebblethwaite 2007; Jansen, Müller & Müller 2012), as in (8–10), so we do not consider that hypothesis further.

(8) hai visto che *geht leicht* Italian/*German* (Jansen et al. 2012: 362)
you.have seen that goes easy
'You have seen that (it) is easy.'

(9) … *decidió que* the matter must be settled… English/*Spanish* (Callahan 2004: 50)
(s)he.decided that
'…(s)he decided that the matter must be settled…'

(10) …I got a heavy feeling that *la amo*, I love her. English/*Spanish* (Callahan 2004: 50)
her.ACC I.love
'…I got a heavy feeling that I love her, I love her.'

Assuming such switches are possible, code-switching researchers have arrived at the same divide that studies based on monolingual data (see §2) revealed: some point to T as the locus of features that determine word order and some point to C.

First, MacSwan (2004) argues the features of T determine subject placement in code-switching. He presents corpus evidence from code-switching between VSO languages and SVO, showing that when the T head is from a VSO language, the subject appears post-verbally, as in (11) and (12), concluding T determines subject position, just as in monolingual approaches that assume the EPP is a feature of T (see also MacSwan 2013).

(11) S-to'oh *mi esposa el coche.* Zapotec (VS)/*Spanish* (SV) (MacSwan 2004: 305)
DEF-sell my wife the car
'My wife will definitely sell the car.'

(12) Fuair sé *thousand pounds.* Irish (VS)/*English* (SV) (MacSwan 2004: 305)
get-PST he
'He got a thousand pounds.'

5 Here, and throughout, we refer to the "language" of a given lexical item or the sake of convenience, but we recognize that named languages such as "Spanish" or "English" are fundamentally social constructions that abstract over many speakers' I-languages, with no clear borders either within or across speakers. We take the "language" of a given lexical item to be merely a convenient shorthand for its syntactic features, without ascribing any theoretical status to the fact that the lexical item is socially assigned to one named language or another. See López (2020) for more detailed discussion on this issue and an enlightening comparison of "languages" in code-switching with "languages" in post-creole continua.

On the other hand, some researchers point to C as the likely determinant of word order in TP. González-Vilbazo and López (2012) propose the Phase Head Hypothesis, which specifies that "the phase head determines grammatical properties of its complement," including word order. They note that (13), with Spanish word order and prosody in the lower clause, is possible, while (14), with German word order and prosody, is not.

(13) *El profe dijo que* alle *han suspendido* in der Prüfung. German/*Spanish* (González-Vilbazo & López 2012: 48)
the teacher said that all have failed in the exam
'The teacher said that they all failed the exam.'

(14) **El profe dijo que* alle in der Prüfung durchgefallen sind. German/*Spanish* (González-Vilbazo & López 2012: 48)
the teacher said that all in the exam failed AUX
'The teacher said that they all failed the exam.'

In a pilot study on Spanish/German CS, González-Vilbazo and López (2013) found support for the notion that C determines word order within TP, and two studies that explicitly considered subject placement and omission in the code-switching of bilingual children arrive at the same conclusion: both Cantone (2007) and Jansen et al. (2012) contend that, in their corpus data from Germanic/Romance bilingual children, it is the language of C that determines the word order within TP, including subject placement.

In summary, two opposed hypotheses find support in both monolingual and code-switching evidence. Experimental approaches can help clarify the empirical picture. Although there has been some experimental work on subject position in Spanish (e.g., Goodall 2004; 2010), for the most part the facts about Spanish have not been in dispute, only the analysis. Thus, we next identify three code-switching experiments useful for situating our project.

3.3 Experimental evidence from code-switching

First, we conducted a previous version of the study we are reporting here, which we consider a pilot for the present work (Ebert & Hoot 2018). That experiment had a similar design, testing pre- and post-verbal subjects in Spanish/English code-switching with an acceptability judgment task when C was English and T Spanish, as in (15), and when C was Spanish and T English, as in (16).

(15) What did the teachers assume that… English/*Spanish* (Ebert & Hoot 2018)
a. … ***el niño*** *había leído antes del examen*?
the child had read before of.the test
b. …*había leído* ***el niño*** *antes del examen*?
'What did the teachers assume that the child had read before the test?'

(16) *Qué asumieron los maestros que…* English/*Spanish* (Ebert & Hoot 2018)
what assumed the teachers that
a. …**the child** had read before the test?
b. …had read **the child** before the test?
'What did the teachers assume that the child had read before the test?'

We found that post-verbal subjects were rated lower than pre-verbal ones across the board and that sentences with English C and Spanish T, like (15), were always better than the reverse. However, we failed to find an interaction between the two factors, suggesting that the acceptability of post-verbal subjects did not differ according to the presence of either C or T. This finding led us to suggest that perhaps both C and T need to be in Spanish to license post-verbal subjects. Yet our previous conclusion suffered from several limitations, which motivate the design of the present study. First, our sample was small: 16 participants. Here we have 36. Second, we did not have the full factorial design, including items with C and T in the same language, and so our conclusion was necessarily somewhat tentative: we had to argue from a lack of effect and could not directly show the effect of C and T together. We include the full factorial design here. The same was true for our monolingual stimuli, for which we did not previously have the full paradigm, which we have also rectified here. Overall, our previous

work points toward a promising conclusion, but it needed additional empirical verification with improved methods, which is a chief motivation for the present study.

Second, Sande (2018) investigated null subjects—which, as we have discussed, are clearly tied to pre-/post-verbal subjects—in Spanish/English code-switching using an acceptability judgment task. Like our work, Sande's experiment focused on the role of C and T in licensing pro-drop, so test sentences always presented a switch between C and T, although Sande identified the language of C as the language of a *wh*-word in CP.

(17) I don't remember who (**Indra**) *amenazó en la fiesta*. English/*Spanish* (Sande 2018: 86)
threatened at the party
'I don't remember who (Indra/she) threatened at the party.'

(18) *No sé qué* (**María**) bought with the money she received. English/*Spanish* (Sande 2018: 86)
no I.know what
'I don't know what (María/she) bought with the money she received.'

She found that null subjects were rated significantly lower than overt subjects when C was English and T was Spanish, as in (17). When C was Spanish and T was English (18), null subjects were also rated slightly lower, although the difference failed to reach statistical significance (perhaps because, much like what we found, switches in this direction were rated much worse overall). Sande proposes that properties of C and T are both required to license null subjects; neither can do it alone. She contends, following González-Vilbazo (2012), that the T head possesses "strong φ-features" that provide *syntactic* licensing for null subjects, while the C head possesses features that "allow for the linking of [null *pro*] to its true referent in the discourse" to provide the necessary *discursive* licensing (Sande 2018: 139–140). Both are therefore needed to allow a null subject in code-switching. Like our own, Sande's study has some limitations. First, she did not explicitly test cases where C and T were both in the same language, which is needed to fully support the hypothesis that both heads together can license null subjects. Second, as mentioned above, the crucial comparison of overt/null subjects with Spanish C and English T failed to reach statistical significance and was very similar in the raw ratings. Finally, she determined the language of C by assuming it was always the same as the language of a *wh*-word, which, although reasonable, does not identify the language of C as unambiguously as a design including overt complementizers would. Nonetheless, that Sande's results from a related but distinct phenomenon point in the same direction as our own pilot study provides an additional reason to expect that an explanation in terms of C and T together is on the right track.

Finally, Vanden Wyngaerd (2020) conducted an acceptability judgment study investigating V2 word order in Dutch/English code-switching. Traditional accounts of V2 claim it is triggered by a feature on C that causes the verb to raise from T, with a few proposals instead pinning it on features of T. Vanden Wyngaerd found that in code-switching the language of the verb determined the word order: when the verb was in Dutch, participants preferred V2 orders (19), and when the verb was in English, participants preferred non-V2 orders (20).

(19) *Wekelijks koken **mijn ouders*** an Asian dish. English/*Dutch* (Vanden Wyngaerd 2020: 5)
every.week cook my parents
'Every week, my parents cook an Asian dish.'

(20) In the book, **Thelma** draws *een schets*. English/*Dutch* (Vanden Wyngaerd 2020: 5)
a sketch
'In the book, Thelma draws a sketch.'

Although her code-switching data points toward an increased role of T in determining V2 and away from the traditional explanations putting the onus on C, she nonetheless notes some independent evidence against accounts focused entirely on T, leading her to conclude that perhaps some type of Feature Inheritance between C and T is the ultimate explanation, which is one of the hypotheses we consider as well.

4 The present study: RQs and predictions

Although there are open questions regarding the properties of subjects in Spanish, what remains clear is that English subjects function in fundamentally distinct ways, which presents an opportunity: code-switching may be able to tease apart possible accounts of Spanish subjects that cannot be distinguished with monolingual data alone. Taking the differences between Spanish and English to ultimately derive from the features of functional heads like C and T, we expect that word order in a given clause will be determined by the features of one or both of the functional heads involved. By manipulating the language (and thus the features) of C and T in code-switched sentences, we may be able to isolate the effects of each head, which in turn can inform the theoretical debates laid out in §2.

We thus seek to answer the following research question: **In Spanish/English code-switching, which functional head (C, T, or both) determines the subject's position in the clause?** From the discussion in §2 and §3, we can identify three groups of possible hypotheses, following Sande's (2018) terminology: the T Hypothesis (T determines subject position), the C Hypothesis (C determines subject position), and the C+T Hypothesis (both C and T together determine subject position). These hypotheses and their predictions are laid out in ***Table 1***.

Table 1 Hypotheses.

Hypothesis	Prediction	Predicted by
T Hypothesis T determines subject position	When **T is English**, subjects are **pre-verbal only** When **T is Spanish**, subjects are **pre- or post-verbal**	Most traditional approaches to the EPP, including Alexiadou & Anagnostopoulou (1998). For CS, MacSwan (2004; 2013), Vanden Wyngaerd (2020).
C Hypothesis C determines subject position	When **C is English**, subjects are **pre-verbal only** When **C is Spanish**, subjects are **pre- or post-verbal**	Pesetsky & Torrego (2001); some versions of FI (e.g., those in which the features originate on C; Chomsky 2001; 2008). For CS, González-Vilbazo & López (2012; 2013), Jansen et al. (2012), Cantone (2007).
C+T Hypothesis C and T together determine subject position	When both **C&T are English**, subjects are **pre-verbal only** When both **C&T are Spanish**, subjects are **pre- or post-verbal** When **C&T are different** languages, subjects are **pre-verbal only**	Some versions of FI (e.g., copying accounts like Gallego 2014; Broekhuis 2016). For CS, Ebert & Hoot (2018), Sande (2018).

The predictions for both the T Hypothesis and C Hypothesis are straightforward, as are the predictions made by the C+T Hypothesis when both heads are in the same language, but the predictions of the C+T Hypothesis are less clear when there is a switch between C and T. It may be possible to extrapolate from the different theoretical proposals that exist regarding the nature of FI, the features involved, and their properties, but there exists no consensus in the field on these ideas and proposals conflict with one another. Instead, we will appeal to the most relevant, concrete proposal of which we are aware and base our predictions on it.

Recall that Sande (2018) argues that null subjects are only licensed when C and T are both in Spanish because a null subject requires both *syntactic* licensing by T and *discursive* licensing by C. Recall further that post-verbal subjects have a similar distribution, occurring as they do also in marked discourse contexts. We thus extend Sande's predictions to the case of pre- and post-verbal subjects. Under this approach, when C is in English and T is in Spanish, the subject *could* appear post-verbally as far as the EPP (a feature of Spanish T) is concerned, but it does not have the relevant *discourse* licensing from English C, and so only pre-verbal subjects will be possible. On the other hand, when C is in Spanish but T is in English, the sentence has the relevant discourse feature to allow post-verbal subjects, but the English EPP does not permit it, so again we will only observe pre-verbal subjects.

To put these hypotheses to the test, we conducted a sentence judgment experiment in which we tested code-switching sentences with each possible combination of C and T. By manipulating the distribution of these two functional heads, we create four possible conditions, and for each one, we tested pre- and post-verbal subjects. ***Table 2*** presents the predictions of each hypothesis

Condition	C	T	Subject Position	T Hypothesis	C Hypothesis	C+T Hypothesis
Th-En-Pre	That	Eng	Pre	OK	OK	OK
Th-En-Pos	That	Eng	Post	Bad	Bad	Bad
Th-Sp-Pre	That	Span	Pre	OK	OK	OK
Th-Sp-Pos	That	Span	Post	OK	Bad	Bad
Qu-En-Pre	Que	Eng	Pre	OK	OK	OK
Qu-En-Pos	Que	Eng	Post	Bad	OK	Bad
Qu-Sp-Pre	Que	Span	Pre	OK	OK	OK
Qu-Sp-Pos	Que	Span	Post	OK	OK	OK

Table 2 Predictions by hypothesis and condition.

for each condition. Note the predictions of special interest in the two rows highlighted in gray, which indicate the cases in which a post-verbal subject is predicted to be acceptable by one hypothesis and not the others, which will allow us to distinguish between the hypotheses.

5 Methods

5.1 Participants

Participants were simultaneous or early sequential Spanish-English bilinguals ($n = 36$), who were either born in the United States or arrived before the age of 7, who reported speaking both Spanish and English before age 7, and who completed their primary and secondary education in the United States. Language background and usage were determined using a brief background questionnaire, which was modified from one used in previous code-switching studies (e.g., Ebert 2014). Participants were recruited at two large universities in the Midwest United States. Potential participants were excluded if they did not have at least one parent or caregiver who spoke Spanish, if they had significant exposure to a language other than Spanish or English, or if they had low proficiency in Spanish, as indicated by a proficiency test.

We estimated proficiency using the Spanish version of the Lexical Test for Advanced Learners of English (LexTALE-Esp; Izura, Cuetos & Brysbaert 2014), which provides an estimate of vocabulary size in approximately five minutes by assessing participants' knowledge of words at different levels of frequency. Research has shown a general correlation between vocabulary size and overall proficiency (Stæhr 2009; Lemhöfer & Broersma 2012), and the LexTALE-Esp has been shown to discriminate well at high and low proficiency levels with other bilingual populations (Izura et al. 2014; Ferré & Brysbaert 2017). Test items include real words with a range of frequencies as well as plausible nonce words. Participants are instructed to indicate which words are real Spanish words while avoiding guessing, since there is a penalty for incorrectly indicating a nonce word is real. Because heritage speakers like our participants are a heterogenous population with a large gamut of linguistic abilities (Polinsky 2018), it was necessary to establish a minimum threshold for Spanish proficiency. Yet because this population also tends to display a "yes-bias" when making judgments about their heritage language (Polinsky 2018) and the LexTALE-Esp penalizes incorrect "yes" answers, it was important not to set the exclusion threshold too high. For this reason, and with the recognition that any proficiency cutoff is somewhat arbitrary, we chose to set it based on the scores of beginning L2 learners, reasoning that scores that low were likely truly indicative of lower proficiency and not merely the score penalty for incorrect "yes" answers. Izura et al. (2014) reported such learners scored an average of 11.9 (compared to 53.9 for the L1 group), so participants with LexTALE-Esp scores below 12 were excluded.

No English proficiency measure was included in the experiment. All participants were raised and educated in the U.S.; therefore, English was expected to be their dominant language, as is commonly the case for heritage speakers of Spanish in the U.S. Indeed, on the background questionnaire self-reported English proficiency was 4.9 out of 5, compared to 4.1 for Spanish.

Of the 105 participants who completed the study, 52 were excluded for not being our target population, either due to information in their background questionnaire or due to a low LexTALE-Esp score. Of the remaining 53, six were excluded because they did not complete the entire task. Finally, we excluded participants that were "non-cooperative" in that they judged the stimuli substantially faster than would be expected for reading and evaluating the sentences (Juzek & Häussler 2015). Following reading and judgment time estimates from Juzek (2016) and Bader and Häussler (2010), we calculated the threshold below which a stimulus was clearly not being processed to be 1000ms. Eleven participants were excluded for having completed 20% or more of their judgments in 1000ms or less, leaving 36 participants for the final sample. Relevant characteristics of these participants are presented in ***Table 3***.

Table 3 Participant characteristics.

Mean age (range)	21.2 (18–31)
Mean age of acquisition of Spanish	Birth
Mean age of acquisition of English	4.5
Mean overall self-reported Spanish proficiency (1–5, 1 = low, 5 = high)	4.1
Mean overall self-reported English proficiency (1–5, 1 = low, 5 = high)	4.9
Mean LexTALE-Esp score (range, σ)	28.5 (12–49, σ = 9.4)

5.2 Procedure

The experiment was completed via the Internet using a combination of the survey platform Qualtrics and the psycholinguistic software Ibex (Drummond 2017).[6] Participants completed six tasks in this order: instructions/training, the code-switching judgment task, two monolingual judgment tasks (one of English sentences and one of Spanish, rotated by participant), the background questionnaire, and the LexTALE-Esp. Each participant was randomly assigned to one of eight lists, among which stimuli for the judgment tasks (see §5.3) were evenly distributed.

Participants first read instructions on how to make acceptability judgments, presented in Spanish/English code-switching (following González-Vilbazo et al. 2013), which included 10 announced practice items with the same format as target items. Second, they completed the CS judgment task, in which they judged 112 sentences: 32 target stimuli and 80 fillers (with a range of acceptability). Sentences were presented one by one and were pseudo-randomized by participant, such that two target items never appeared sequentially. Participants recorded their judgments on a seven-point numerical scale with labeled endpoints (1 = *mal* 'bad'; 7 = *bien* 'good')[7] by clicking on the desired number below the sentence, whereupon the next sentence was displayed. After the code-switching task came the two monolingual tasks testing their Spanish and English grammars separately, with the same style of presentation. Each consisted of 48 sentences: 16 target stimuli and 32 fillers (with a range of acceptability). For each of the eight lists, half the participants judged the monolingual Spanish stimuli before the monolingual English stimuli, and half had the opposite order. Between each judgment task, participants were instructed to take a break if needed. Finally, they completed the background questionnaire and LexTALE-Esp.

5.3 Materials

5.3.1 Checking monolingual judgments

As González-Vilbazo et al. (2013) point out, it is essential in experimental work on code-switching to test participants' monolingual judgments of the relevant phenomena in each language. Named languages like "Spanish" and "English" are abstractions across many speakers' I-languages, and researchers should thus not assume that a given person's idiolect reflects what is claimed to be the case for their language. Furthermore, given that code-switchers are necessarily bilingual, and bilinguals are not two monolinguals rolled up into one person, it is important to verify that their grammatical systems in each language have the properties

6 On the validity of internet-based judgment experiments, see Sprouse (2011).

7 Literally, *mal* means 'poorly' and *bien* means 'well,' but these adverbial forms are used in the sense of 'sounds/seems good/bad.'

we expect. This is especially true for subjects in U.S. Spanish, which display cross-linguistic influence from English in similar populations (Cuza 2012). To that end, we tested pre- and post-verbal subjects in sentences consisting of only Spanish or only English, with the aim of verifying that each grammatical system was as expected.

As discussed in §2, Spanish subjects can be post-verbal in several different environments, and not all types of post-verbal subjects are necessarily the same (Villa-García 2018). In particular, it has been claimed that many varieties of Spanish either allow or require post-verbal subjects in all clauses through which a *wh*-word has moved (Torrego 1984), which would cause sentences with questions extracted from a subordinate clause (21) to exhibit post-verbal subjects in a way that declarative sentences (22) might not, because post-verbal subjects in declarative sentences may be regulated by discourse factors like focus (Zubizarreta 1998).

(21) *¿Qué dice el niño que han creado **sus maestros** para los estudiantes?*
what says the boy that have created his teachers for the students
'What does the boy say that his teachers have created for the students?'

(22) *El niño dice que **sus maestros** han creado esta actividad para los estudiantes.*
the boy says that his teachers have created this activity for the students
'The boy says that his teachers have created this activity for the students.'

In testing their monolingual judgments, therefore, we chose to investigate pre- and post-verbal subjects in both declarative sentences and those with a *wh*-question for both languages, resulting in a 2×2 factorial design for each language. All the questions extracted the direct object from the subordinate clause.

The monolingual English stimuli crossed sentence Type (Declarative/Question) with Subject Position (Pre-/Post-verbal). Example stimuli are presented in ***Table 4***.

Table 4 Monolingual English stimuli.

Condition	Type	Subject Position	Example
En-Q-Pre	Question	Pre	What does the boy say that **his teachers** have created for the students?
En-Q-Pos	Question	Post	What does the boy say that have created **his teachers** for the students?
En-D-Pre	Declarative	Pre	The boy says that **his teachers** have created this activity for the students.
En-D-Pos	Declarative	Post	The boy says that have created **his teachers** this activity for the students.

Sixteen token sets were created, so that participants saw four items in each cell of the design, each from a different token set. Items from a given token set never repeated within either language, but the Spanish and English stimuli were translation equivalents; each participant thus saw one item from each token set in Spanish and one item from each token set in English, although never the exact same sentence in translation. As described in §5.2, individual tokens from each set were distributed with a Latin square design across eight experimental lists for each language.

To control for frequency, the verb and its arguments came from the 5,000 most frequent Spanish words (Davies 2006) or the 5,000 most frequent English words (Davies 2008). Each monolingual stimulus consisted of a biclausal sentence with an overt complementizer, and the predicate always contained an auxiliary verb (to make them parallel to the code-switching sentences and uniquely identify T). Matrix verbs were always verbs in present tense that take clausal complements and subordinate-clause verbs were always simple transitive verbs in the present perfect. The matrix-clause subject was singular and the subordinate-clause subject was plural to avoid the possibility of construing the subordinate-clause verb as referring to the matrix subject. All subjects were two-word definite DPs but were not controlled for gender. All sentences ended in an adjunct—a PP, relative clause, or AdvP—so that the direct object (which was extracted in the question condition) was not the sentence-final constituent and sentences across conditions would be as uniform as possible to avoid introducing additional confounds.

The Spanish stimuli had the same 2×2 design as the English stimuli; the examples in *Table 5* are exact translations of the corresponding English examples in *Table 4*.

Condition	Type	Subject Position	Example
Sp-Q-Pre	Question	Pre	¿Qué dice el niño que **sus maestros** han creado para los estudiantes?
Sp-Q-Pos	Question	Post	¿Qué dice el niño que han creado **sus maestros** para los estudiantes?
Sp-D-Pre	Declarative	Pre	El niño dice que **sus maestros** han creado esta actividad para los estudiantes.
Sp-D-Pos	Declarative	Post	El niño dice que han creado **sus maestros** esta actividad para los estudiantes.

Table 5 Monolingual Spanish stimuli.

5.3.2 Code-switching judgment task

The code-switching task was designed to test the role of C and T on the acceptability of pre- and post-verbal subjects. It thus had a 2×2×2 design: C (Spanish *que*/English *that*), T (Spanish/English), and Subject Position (Pre-/Post-verbal). The paradigm is exemplified in *Table 6*.

Condition	C	T	Subject Position	Example[8]
Th-En-Pre	That	Eng	Pre	*Qué piensa tu padre* that **your brothers** have bought at the store?
Th-En-Pos	That	Eng	Post	*Qué piensa tu padre* that have bought **your brothers** at the store?
Th-Sp-Pre	That	Span	Pre	What does your dad think that ***tus hermanos*** *han comprado en la tienda?*
Th-Sp-Pos	That	Span	Post	What does your dad think that *han comprado* ***tus hermano****s en la tienda*?
Qu-En-Pre	Que	Eng	Pre	*Qué piensa tu padre que* **your brothers** have bought at the store?
Qu-En-Pos	Que	Eng	Post	*Qué piensa tu padre que* have bought **your brothers** at the store?
Qu-Sp-Pre	Que	Span	Pre	What does your dad think *que* ***tus hermanos*** *han comprado en la tienda?*
Qu-Sp-Pos	Que	Span	Post	What does your dad think *que han comprado* ***tus hermanos*** *en la tienda?*

Table 6 Code-switching stimuli.

All the sentences were questions, consisting of two clauses, with the question word extracted from the direct object position in the subordinate clause. We did not include declarative sentences in the code-switching task to keep the number of items manageable for participants. The *wh*-word was always *what* or its Spanish equivalent, *qué*. We omitted the initial inverted question mark used in standard Spanish orthography for the sake of uniformity. We used biclausal sentences so that the language of C would be unambiguous; each sentence included an overt complementizer, either *that* or its equivalent, *que*. Each subordinate clause also included a verb with an auxiliary to unambiguously identify the T head. Both clauses had the same controls on verb tense/type, subject number and definiteness, and adjuncts as in the monolingual tasks (§5.3.1).

We chose to limit code-switching to a single instance in each sentence to avoid awkward, single-word switches. Each sentence thus either started in Spanish and ended in English or vice versa, with the switch site always either just before or just after the complementizer.

8 Spanish is italicized here by convention, but no words were italicized for participants. All these sentences are code-switched versions of the question 'What does your dad think that your brothers have bought at the store?'

We created 32 token sets, distributed via eight lists in a Latin square, such that participants saw four items from each cell of the design and no token sets were repeated. All the token sets contained the same words with the same frequency controls as those used in the monolingual tasks, but in new combinations, so that the code-switching stimuli did not repeat the sentences from the monolingual tasks.

6 Results

6.1 Interpreting judgment data

Interpreting sentence acceptability judgments is not as straightforward as it might appear. Linguistic theory is interested in *grammaticality*—a binary notion of whether a given sentence can be generated by individuals' grammars—while judgment experiments provide evidence of *acceptability*—a gradient notion of subjective "naturalness." Acceptability is a complex psychological construct, which is affected by many extra-grammatical factors and does not directly map to grammaticality (Cowart 1997; Schütze & Sprouse 2013). For instance, even if they are perfectly grammatical, we might expect post-verbal subjects will always be rated lower than pre-verbal subjects, because they depart from the canonical word order, are less frequent, and are more marked than simple SVO in active sentences with transitive predicates. The same is true of all code-switching between C and T, which we know to be possible but rare (see §3), and which we thus expect to reduce acceptability.

Schütze and Sprouse (2013), among others, advocate for factorial designs as a strategy for addressing the confounds inherent to acceptability judgments. In such a design, the factor of interest is crossed with another factor, producing a 2×2 grid, which allows researchers to isolate the effect of interest by looking at how the relevant effect *changes* between the two levels of the other factor. Sprouse et al. (2016) call these *super-additive effects*, and they are revealed by an interaction in the statistical analysis. For example, we expect post-verbal subjects to produce a decrease in acceptability for extra-syntactic reasons. If, however, Spanish T has the syntactic features which make post-verbal subjects acceptable, then post-verbal subjects should be more acceptable than expected when the sentence has Spanish T, i.e. there should be an interaction between the language of T and the position of the subject, which is the super-additive effect. Likewise, if C houses the relevant syntactic features, Spanish C should produce a super-additive effect, and if some of the necessary features are present on C and some on T, we expect a super-additive effect only when both C and T are in Spanish. Another way of understanding the factorial logic is: we expect post-verbal subjects to produce a consistent decrement in acceptability, but the acceptability decrease for post-verbal subjects will be *ameliorated* under certain conditions, and it is that amelioration that points to the presence of syntactic features permitting post-verbal subjects.

Turning to the details of our analysis, Schütze and Sprouse (2013) argue that all judgment data should be z-score transformed to reduce scale bias and skew, so we use z-scores for the statistical analysis. At the same time, we also recognize that the raw ratings can be informative. Therefore, we report both the z-scores and the raw ratings.

For the statistical analysis, we chose to conduct a linear mixed-effects model (LMM) for each 2×2 factorial design within each of the tasks. For the code-switching experiment, which had a $2 \times 2 \times 2$ design, we chose to carry out a series of 2×2 tests rather than a single three-factor model because the interpretation is clearer. In all cases, the dependent variable was the z-score of the ratings, and the fixed effects included in the model were those determined by the experiment design: all the independent variables and their interactions. The random effects structure in each case was the maximal structure that converged for that set of data, following Barr et al. (2013).

We carried out the LMMs using SPSS's MIXED procedure, and in what follows we report the results of the Type III test of fixed effects, which produces an F statistic. Because what we are interested in is whether there is a *super-additive* effect, our outcome of interest is always the interaction between Subject Position and the other factors. For the sake of completeness, we report the regression coefficients (beta), but focus mainly on the F statistic and its accompanying

p value, setting alpha at .05.[9] Whenever possible, we also report Bonferroni-corrected post hoc pairwise comparisons to examine differences between conditions, and, when reporting the z-score results for each condition, we report the estimated marginal means generated to make those pairwise comparisons (rather than raw mean z-scores).

Prior to data collection, we carried out a power analysis via simulation, adapted from Lane and Hennes (2018). The challenge with any power analysis is defining *a priori* what effect sizes are meaningful; one of the best ways to make that determination is to base it on previous research or pilot studies. We chose to look to our previous work on this topic (Ebert & Hoot 2018) to define minimal effect sizes for main effects and interactions of the statistical tests we intended to carry out, as well as to make reasonable assumptions about the amount of variance we expected to find in our data. Under these reasonable assumptions we found that with a sample size of $n = 20$, we would have 80% power or greater for all our planned statistical tests. We are thus confident that our sample size ($n = 36$) represents an experiment with acceptable power.

6.2 Monolingual English results

Recall from §5.3.1 that the English monolingual task had a 2×2 factorial design, with Type (Declarative/Question), Subject Position (Pre-/Post-verbal), and their interaction as fixed factors. The maximal random effects structure that converged included random intercepts by subject and item and a by-item random slope over the Type×Subject Position interaction. A Type III test of fixed effects yielded a significant effect for Subject Position ($\beta = 1.62$, $F(1,40) = 687.6$, $p < .001$) and the interaction of Type×Subject Position ($\beta = 0.59$, $F(1,46) = 22.1$, $p < .001$), but not for Type ($\beta = 0.07$, $F(1,46) = 1.3$, $p = .258$). Bonferroni-corrected post hoc pairwise comparisons revealed that for both sentence types post-verbal subjects were rated lower than pre-verbal (both $p < .001$); when subjects were pre-verbal, declarative sentences were significantly better than questions ($p < .001$), while when subjects were post-verbal, questions were better than declaratives ($p = .016$). ***Table 7*** presents the results by condition; ***Figure 1*** visually represents the raw ratings and ***Figure 2*** the z-scores.

Table 7 Monolingual English results.

Condition	Type	Subject Position	Example	Raw mean rating	Estimated marginal mean z-score of rating
En-Q-Pre	Question	Pre	What does the boy say that **his teachers** have created for the students?	5.55	0.40
En-Q-Pos	Question	Post	What does the boy say that have created **his teachers** for the students?	1.91	−0.93
En-D-Pre	Declarative	Pre	The boy says that **his teachers** have created this activity for the students.	6.45	0.77
En-D-Pos	Declarative	Post	The boy says that have created **his teachers** this activity for the students.	1.49	−1.15

These results show a clear acceptability penalty for post-verbal subjects in English for questions and declarative sentences, as expected. The interaction between the two factors indicates, surprisingly, a small amelioration of that penalty in questions, when compared to declaratives. Given that questions are, as expected, nearly 1 point lower in acceptability even with pre-verbal subjects and that post-verbal subjects are rated near the bottom of the scale for both sentence types, at least part of the unexpected amelioration may therefore be a floor effect

9 Note that, although some statistical software does not produce p values for LMMs or does so with a different method, SPSS uses the Satterthwaite approximation to calculate denominator degrees of freedom to produce "an accurate F-test approximation, and hence accurate p-values for the F-test" (Ender 2011: 20).

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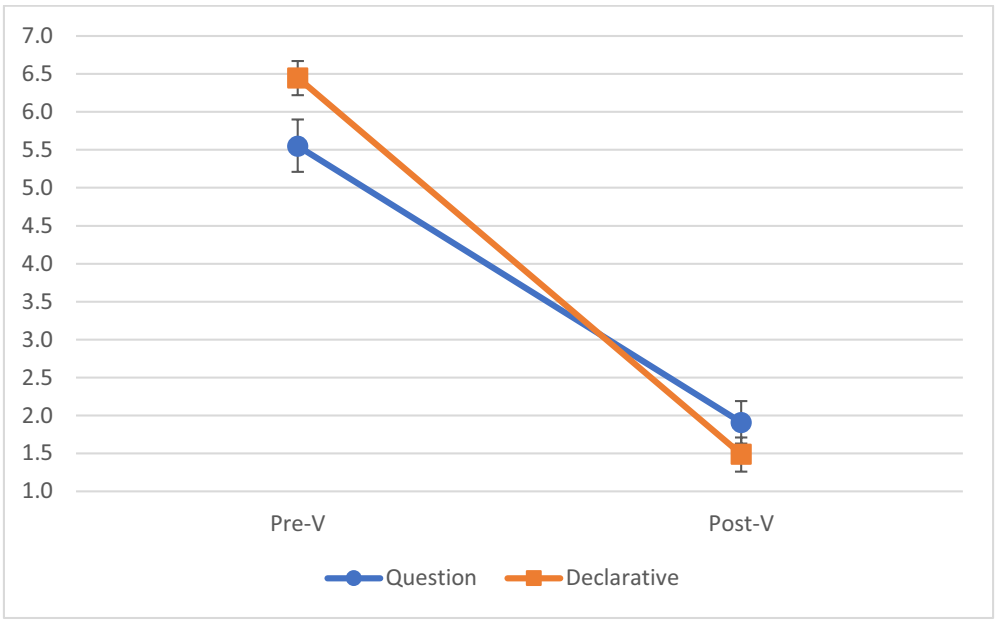

Figure 1 Mean raw ratings by sentence type and subject position, monolingual English.[10]

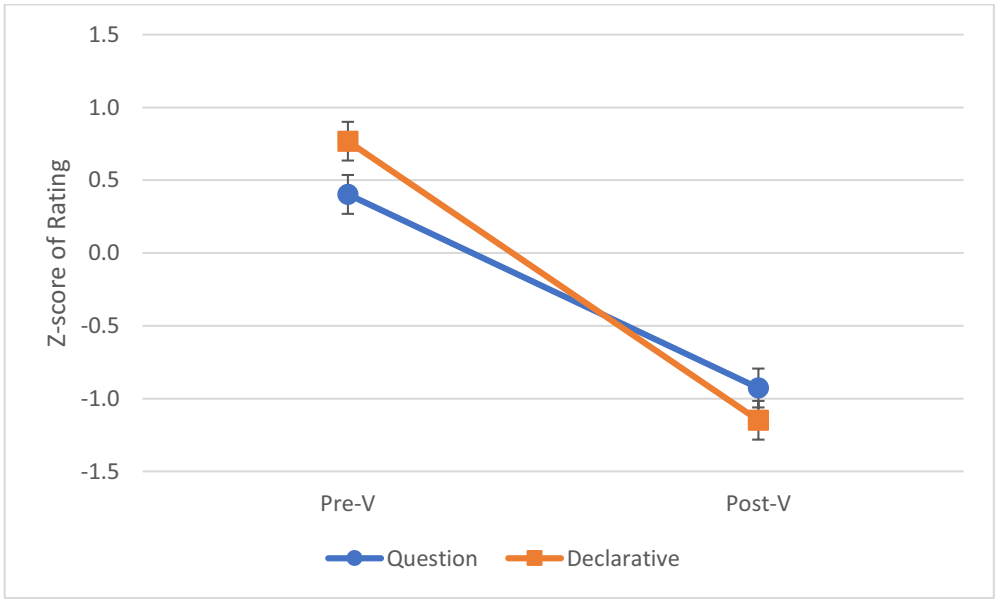

Figure 2 Estimated marginal mean z-scores of ratings by sentence type and subject position, monolingual English.

(i.e., with post-verbal subjects, the questions cannot be a point lower than the declaratives, because the scale ends). Crucially, the difference in raw ratings between pre- and post-verbal subjects (near the ceiling and floor of the scale, respectively) makes clear that these participants have English grammars of the expected sort, with a strong penalty for post-verbal subjects.

6.3 Monolingual Spanish results

The Spanish monolingual task had the same 2×2 factorial design as the English task; the maximal random effects structure that converged was also the same. The Type III test of fixed effects yielded a significant effect for Subject Position ($\beta = 0.27, F(1,26) = 17.2, p < .001$) but not for Type ($\beta = 0.12, F(1,14) = 2.3, p = .154$), as well as a marginal interaction for Subject Position × Type ($\beta = 0.26, F(1,26) = 4.1, p = .054$). A single post hoc pairwise comparison by Subject Position revealed that post-verbal subjects were significantly worse than pre-verbal overall ($p < .001$). ***Table 8*** presents the results by condition; ***Figure 3*** visually represents the raw ratings and ***Figure 4*** the z-scores.

10 Here, and throughout, error bars are the 95% confidence interval of the estimate.

Condition	Type	Subject Position	Example	Raw mean rating	Estimated marginal mean z-score of rating
Sp-Q-Pre	Question	Pre	¿Qué dice el niño que **sus maestros** han creado para los estudiantes?	5.99	0.43
Sp-Q-Pos	Question	Post	¿Qué dice el niño que han creado **sus maestros** para los estudiantes?	5.65	0.30
Sp-D-Pre	Declarative	Pre	El niño dice que **sus maestros** han creado esta actividad para los estudiantes.	6.60	0.68
Sp-D-Pos	Declarative	Post	El niño dice que han creado **sus maestros** esta actividad para los estudiantes.	5.58	0.29

Table 8 Monolingual Spanish results.

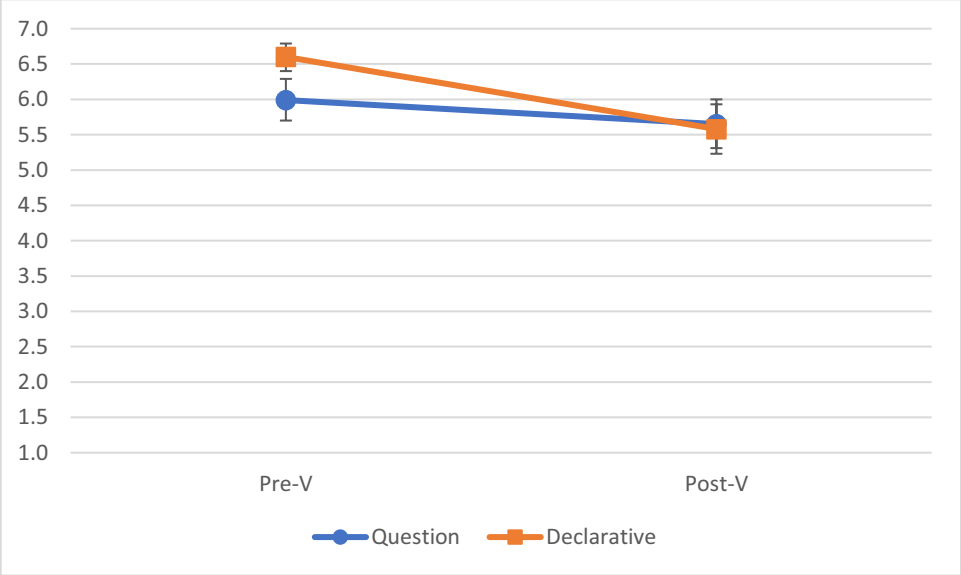

Figure 3 Mean raw ratings by sentence type and subject position, monolingual Spanish.

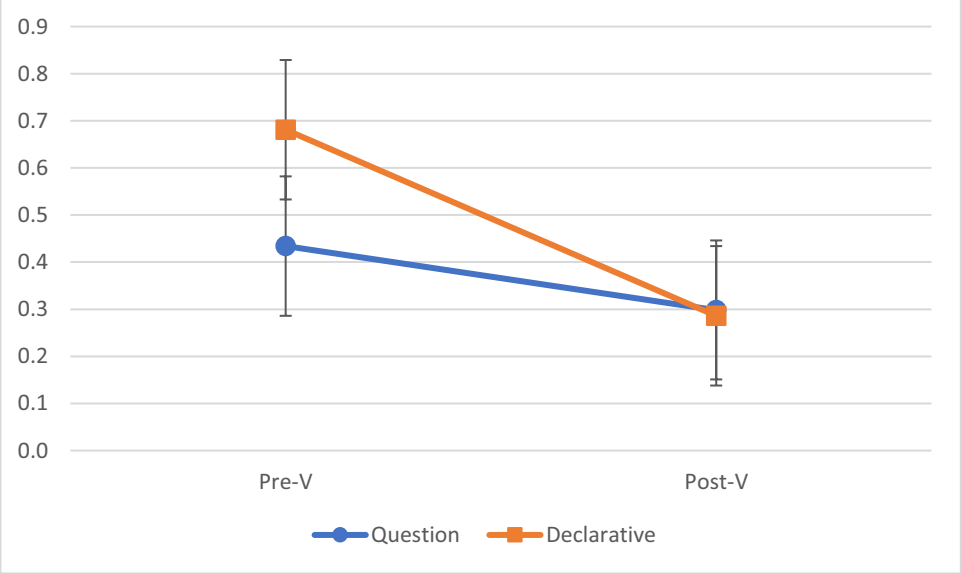

Figure 4 Estimated marginal mean z-scores of ratings by sentence type and subject position, monolingual Spanish.

The Spanish results show that post-verbal subjects were penalized slightly, which is to be expected even if post-verbal subjects are entirely grammatical.[11] Like with the English results, the raw ratings help clarify the picture here: despite the expected decrement in acceptability of post-verbal subjects, the ratings are near the top of the scale and decrease appreciably less than the corresponding English stimuli when compared to pre-verbal subjects. We take these results to indicate that these speakers have grammars in Spanish that permit post-verbal subjects, while their grammars in English do not.

6.4 Code-switching results

As explained in §6.1, we chose to carry out a series of 2 × 2 statistical tests for the sake of clarity of interpretation. For completeness and transparency, though, we also provide a table with the raw ratings for the eight conditions together and a graph of the distribution of each answer on the scale for each condition in Supplementary File 1.

6.4.1 Code-switching results: English C

Let us first examine cases with English C *that* held constant and compare two fixed factors—Language of T (Spanish/English) and Subject Position (Pre-/Post-verbal)—plus their interaction, presented in ***Table 9***.

Table 9 Code-switching results: English C.

Condition	C	T	Subject Position	Example	Raw mean rating	Estimated marginal mean z-score of rating
Th-En-Pre	That	Eng	Pre	*Qué piensa tu padre* that **your brothers** have bought at the store?	5.13	0.29
Th-En-Pos	That	Eng	Post	*Qué piensa tu padre* that have bought **your brothers** at the store?	2.97	–0.64
Th-Sp-Pre	That	Span	Pre	What does your dad think that ***tus hermanos*** *han comprado en la tienda?*	5.13	0.29
Th-Sp-Pos	That	Span	Post	What does your dad think that *han comprado* ***tus hermanos*** *en la tienda?*	3.51	–0.37

The maximal random effects structure included random intercepts by subject and item, a random by-subject slope over Subject Position, and a random by-subject slope over the interaction. The Type III test of fixed effects yielded a significant effect for Subject Position ($\beta = 0.79$, $F(1,37) = 88.7$, $p < .001$) but not for Language of T ($\beta = –0.13$, $F(1,64) = 2.7$, $p = .108$) or their interaction ($\beta = 0.27$, $F(1,74) = 2.8$, $p = .096$).

Visual inspection of both the raw ratings (***Figure 5***) and the estimated marginal mean z-scores (***Figure 6***) reveals a pattern like that of a super-additive effect, but the interaction between Language of T and Subject Position fails to reach statistical significance. This fact could indicate there is a small effect here and that our experiment did not have enough power to detect it. However, as noted in §6.1, we conducted a power analysis prior to data collection and found that, under reasonable assumptions about variance and effect sizes, our sample had sufficient power to detect relevant effects. Because the interaction was not significant, we conducted only a post hoc pairwise comparison by Subject Position, which revealed, as is clear from the graphs, that pre-verbal subjects were rated significantly higher than post-verbal subjects ($p < .001$).

We take this result to indicate that code-switching sentences behave like English when C is in English, with post-verbal subjects consistently penalized, regardless of the language of T.

11 An anonymous reviewer points out that their judgments improve considerably without the adjunct (i.e., *El niño dice que han creado* ***sus maestros*** *esta actividad*. 'The boy says that have created **his teachers** this activity.'). Perhaps the sentence-final adjuncts—included to make the sentences uniform—are partially to blame for the decrement in acceptability in the post-verbal condition with declaratives.

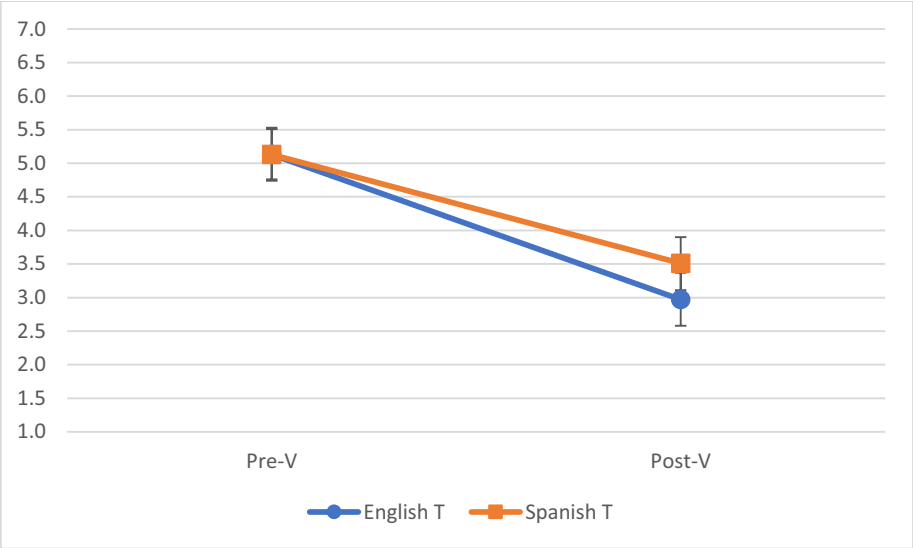

Figure 5 Mean raw ratings by language of T and subject position when C is English *that*.

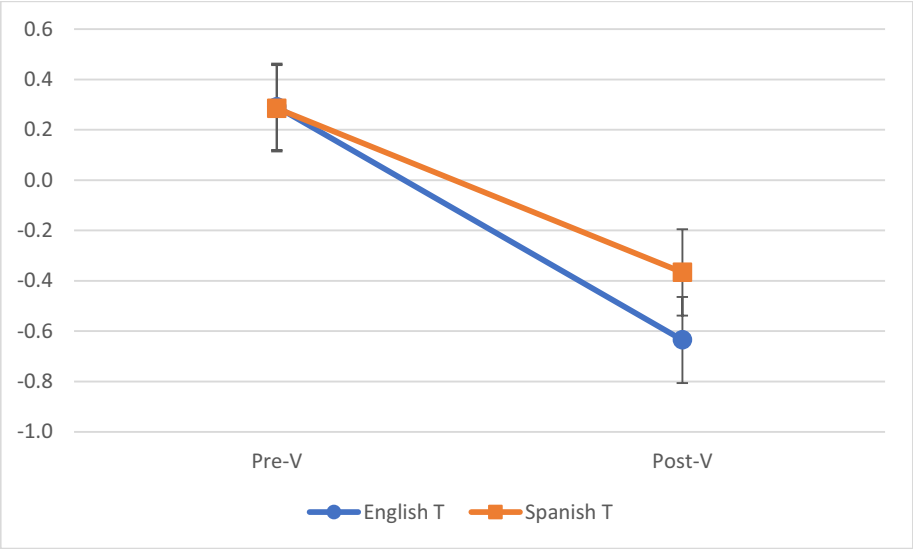

Figure 6 Estimated marginal mean z-scores of ratings by language of T and subject position when C is English *that*.

6.4.2 Code-switching results: Spanish C

Turning now to Spanish C *que* (***Table 10***), the fixed effects had the same 2 × 2 distribution, and the maximal random effects structure was also the same. However, in this case, the Type III test of fixed effects yielded a significant effect for Subject Position ($\beta = 0.51$, $F(1,31) = 40.9$, $p < .001$), for Language of T ($\beta = -0.83$, $F(1,68) = 134.4$, $p < .001$), and for their interaction ($\beta = 0.66$, $F(1,83) = 20.8$, $p < .001$). Bonferroni-corrected post hoc pairwise comparisons

Table 10 Code-switching results: Spanish C.

Condition	C	T	Subject Position	Example	Raw mean rating	Estimated marginal mean z-score of rating
Qu-En-Pre	Que	Eng	Pre	*Qué piensa tu padre que* **your brothers** have bought at the store?	4.37	–0.02
Qu-En-Pos	Que	Eng	Post	*Qué piensa tu padre que* have bought **your brothers** at the store?	2.34	–0.86
Qu-Sp-Pre	Que	Span	Pre	What does your dad think ***que tus hermanos*** *han comprado en la tienda?*	5.55	0.48
Qu-Sp-Pos	Que	Span	Post	What does your dad think *que han comprado* ***tus hermanos*** *en la tienda?*	4.98	0.30

revealed that post-verbal subjects were rated lower overall than pre-verbal ($p < .001$) and sentences with English T (and thus a code-switch between C and T) were rated lower overall than sentences with Spanish T ($p < .001$), as expected. Pairwise comparisons also indicated that, when T was in English, post-verbal subjects were rated significantly lower than pre-verbal subjects ($p < .001$); when T was in Spanish, though, we failed to find a significant difference between pre- and post-verbal subjects ($p = .107$). Visual inspection of the results in ***Figures 7*** and ***8*** revealed the characteristic pattern of a super-additive effect.

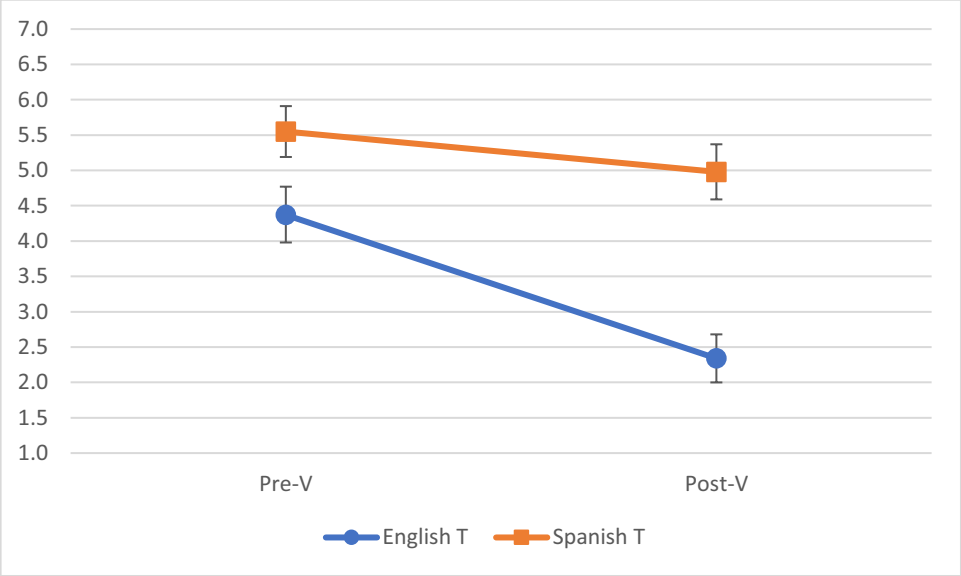

Figure 7 Mean raw ratings by language of T and subject position when C is Spanish *que*.

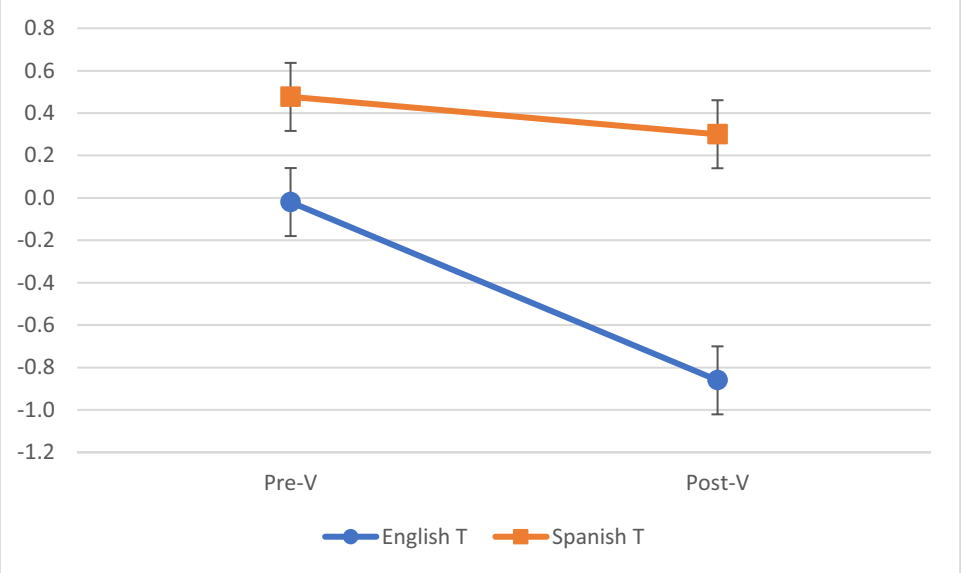

Figure 8 Estimated marginal mean z-scores of ratings by language of T and subject position when C is Spanish *que*.

Both the statistical results and the figures point to an effect of Spanish T in this case: the reduction in acceptability occasioned by post-verbal subjects is ameliorated by the presence of Spanish T alongside Spanish C *que*.

Although we have reported the outcome of each of the eight conditions in our experiment at this point, it is illuminating to consider the results in a different way: for the next two analyses, instead of holding C constant, we hold T constant and compare the effects of manipulating the language of C.

6.4.3 Code-switching results: English T

Turning first to sentences with English T (***Table 11***), we had a 2×2 design with Language of C (English *that*/Spanish *que*), Subject Position (Pre-/Post-verbal), and their interaction as fixed factors. The maximal random effects structure included random intercepts by subject and item, as well as by-item random slopes over Language of C and over its interaction with Subject

Position, and a by-subject random slope over the interaction. The Type III test of fixed effects yielded a significant effect for Subject Position ($\beta = 0.88$, $F(1,60) = 99.9$, $p < .001$) and for Language of C ($\beta = 0.27$, $F(1,42) = 8.9$, $p = .005$), but no interaction ($\beta = 0.07$, $F(1,59) = 0.2$, $p = .691$). Bonferroni-corrected post hoc pairwise comparisons revealed that post-verbal subjects were rated lower overall than pre-verbal ($p < .001$) and sentences with Spanish C (and thus a code-switch between C and T) were rated lower overall than sentences with English C ($p = .005$). Visual inspection of the results in ***Figures 9*** and ***10*** revealed no super-additive effect.

Condition	C	T	Subject Position	Example	Raw mean rating	Estimated marginal mean z-score of rating[12]
Th-En-Pre	That	Eng	Pre	*Qué piensa tu padre* that **your brothers** have bought at the store?	5.13	0.29
Th-En-Pos	That	Eng	Post	*Qué piensa tu padre* that have bought **your brothers** at the store?	2.97	−0.62
Qu-En-Pre	Que	Eng	Pre	*Qué piensa tu padre que* **your brothers** have bought at the store?	4.37	−0.02
Qu-En-Pos	Que	Eng	Post	*Qué piensa tu padre que* have bought **your brothers** at the store?	2.34	−0.86

Table 11 Code-switching results: English T.

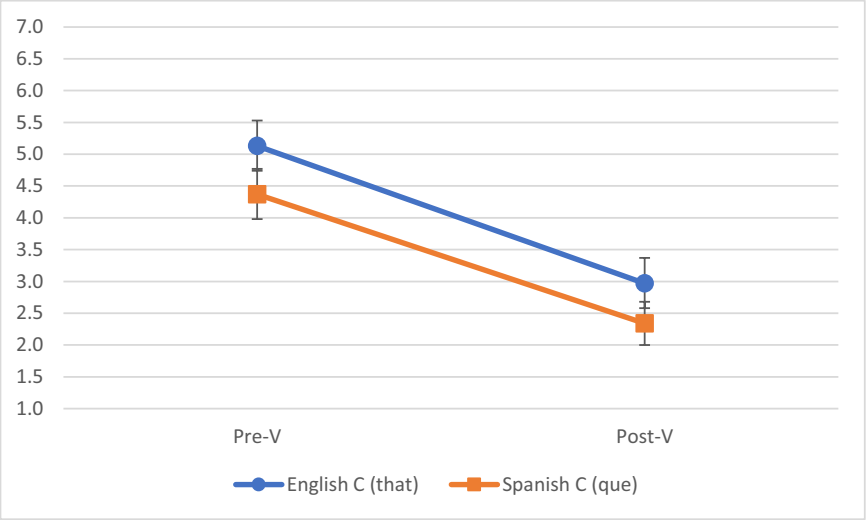

Figure 9 Mean raw ratings by language of C and subject position when T is English.

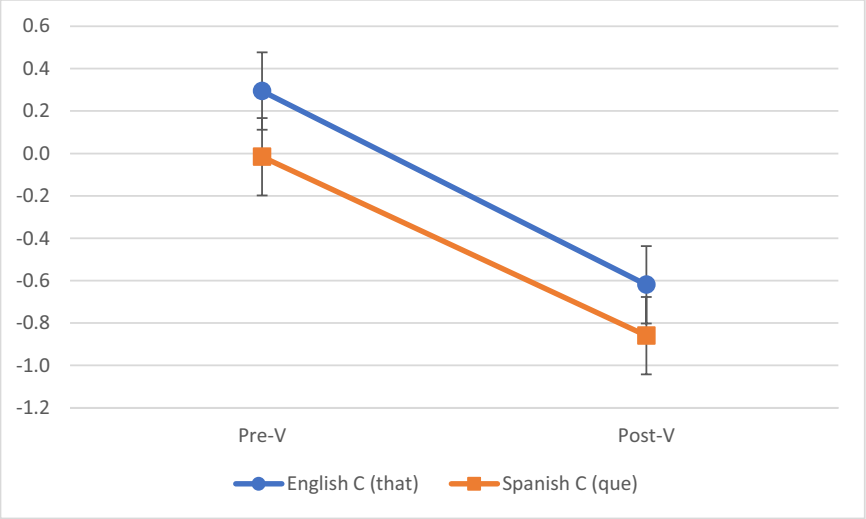

Figure 10 Estimated marginal mean z-scores of ratings by language of C and subject position when T is English.

The result of this analysis shows that acceptability is penalized for switching between C and T and for post-verbal subjects overall, but we find no interaction between post-verbal subjects and the distribution of C/T. Instead, post-verbal subjects are consistently lower in acceptability than pre-verbal subjects with English T, even with a Spanish C.

6.4.4 Code-switching results: Spanish T

Finally, we held T constant in Spanish and made the same 2 × 2 comparison (***Table 12***). In this case, the maximal random effects structure included a random intercept by subject and item, and a random by-subject slope over the interaction of the fixed effects. The Type III test of fixed effects yielded a significant effect for Subject Position ($\beta = 0.39$, $F(1,112) = 23.6$, $p < .001$), for Language of C ($\beta = -0.44$, $F(1,103) = 33.0$, $p < .001$), and for their interaction ($\beta = 0.50$, $F(1,103) = 10.3$, $p = .002$). Bonferroni-corrected post hoc pairwise comparisons revealed that post-verbal subjects were rated lower overall than pre-verbal ($p < .001$) and sentences with English C (and thus a code-switch between C and T) were rated lower overall than sentences with Spanish C ($p < .001$). Pairwise comparisons also indicate that, when C was in English, post-verbal subjects were rated significantly lower than pre-verbal subjects ($p < .001$); when C was in Spanish, though, we failed to find a significant difference between pre- and post-verbal subjects ($p = .198$). Visual inspection of the results in ***Figures 11*** and ***12*** revealed the characteristic pattern of a super-additive effect.

Table 12 Code-switching results: Spanish T.

Condition	C	T	Subject Position	Example	Raw mean rating	Estimated marginal mean z-score of rating
Th-Sp-Pre	That	Span	Pre	What does your dad think that ***tus hermanos*** *han comprado en la tienda?*	5.13	0.27
Th-Sp-Pos	That	Span	Post	What does your dad think that *han comprado* ***tus hermanos*** *en la tienda?*	3.51	–0.37
Qu-Sp-Pre	Que	Span	Pre	What does your dad think *que* ***tus hermanos*** *han comprado en la tienda?*	5.55	0.46
Qu-Sp-Pos	Que	Span	Post	What does your dad think *que han comprado* ***tus hermanos*** *en la tienda?*	4.98	0.32

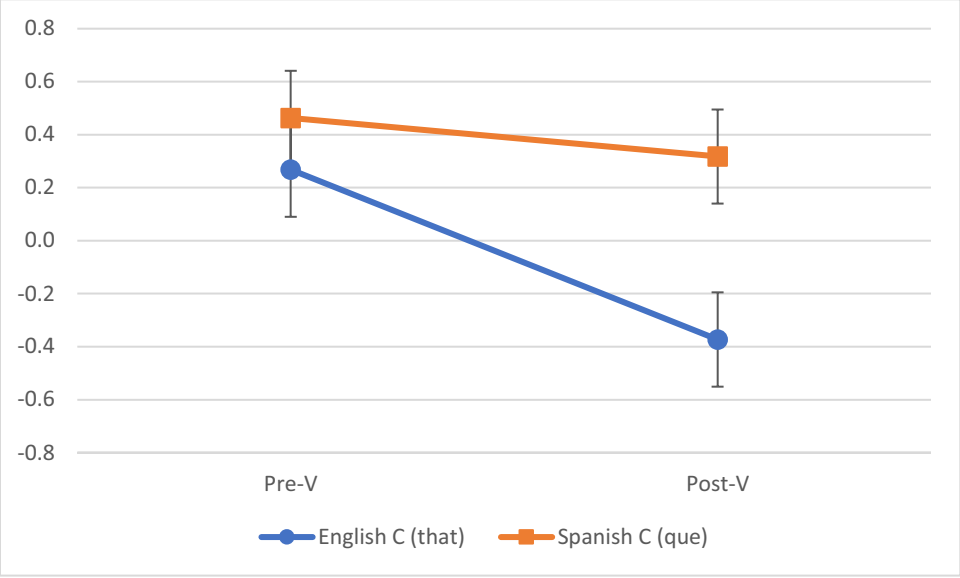

Figure 11 Mean raw ratings by language of C and subject position when T is Spanish.

12 The EMMs reported here are slightly different than those reported for the same conditions' results in the previous two tables because EMMs are estimates calculated according to the parameters of each model and thus vary according to the data included in the model.

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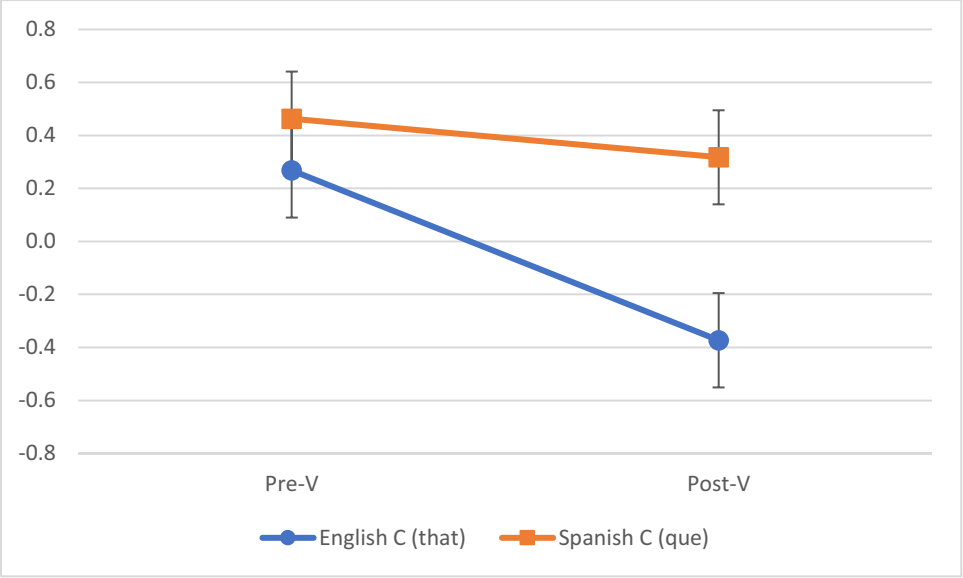

Figure 12 Estimated marginal mean z-scores of ratings by language of C and subject position when T is Spanish.

We observe a penalty for switches between C and T and for post-verbal subjects overall, but the most relevant finding is the super-additive effect: the acceptability penalty for post-verbal subjects is significantly ameliorated when C is in Spanish.

6.4.5 Summary of code-switching results

When we hold C constant, we find that post-verbal subjects are consistently penalized when C is in English (§6.4.1), irrespective of the language of T, whereas the acceptability of post-verbal subjects varies when C is in Spanish (§6.4.2): post-verbal subjects are much more acceptable when T is also in Spanish. A similar pattern emerges when we hold T constant. When T is English (§6.4.3), post-verbal subjects are much worse regardless of the language of C; when T is Spanish (§6.4.4), it varies, such that post-verbal subjects are more acceptable when C is also Spanish.

Figure 13 presents the rating for pre-verbal (blue line with circles) and post-verbal (orange line with squares) subjects for each of the four possible combinations of C and T. On the secondary y-axis, it shows the difference between the two (gray bars). This graph shows that post-verbal subjects are consistently penalized, but that penalty largely disappears when both C and T are in Spanish.

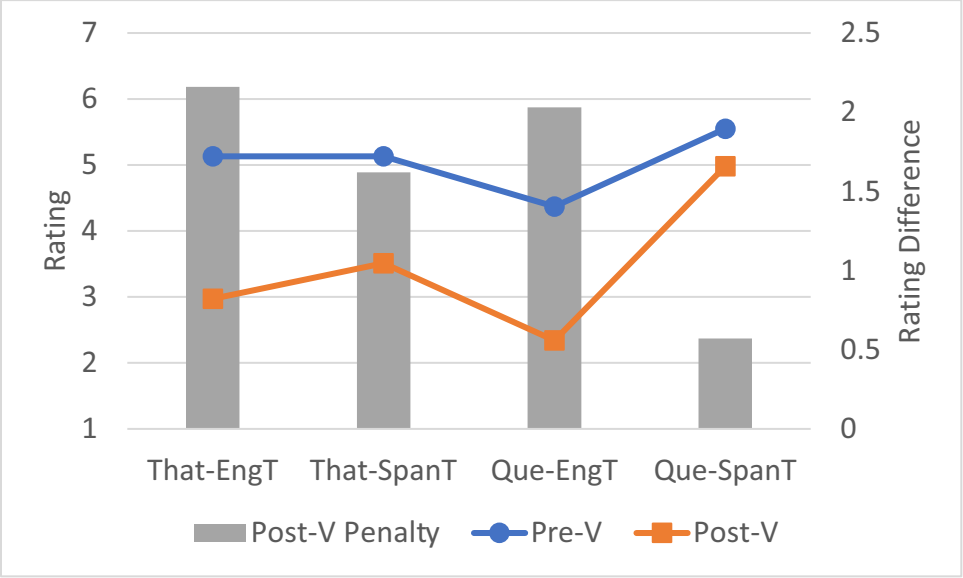

Figure 13 Differences in acceptability, pre- and post-verbal subjects, by language of C and T.

7 Discussion

7.1 Evaluating predictions

Returning to our research question, we asked: In Spanish/English code-switching, which functional head (C, T, or both) determines the subject's position in the clause? We considered three hypotheses and their predictions for each experimental condition. ***Table 13*** reviews those

Condition	C	T	Subject Position	T Hypothesis		C Hypothesis		C+T Hypothesis	
				Pred.	Result	Pred.	Result	Pred.	Result
Th-En-Pre	That	Eng	Pre	OK	Right!	OK	Right!	OK	Right!
Th-En-Pos	That	Eng	Post	Bad	Right!	Bad	Right!	Bad	Right!
Th-Sp-Pre	That	Span	Pre	OK	Right!	OK	Right!	OK	Right!
Th-Sp-Pos	That	Span	Post	OK	Nope!	Bad	Right!	Bad	Right!
Qu-En-Pre	Que	Eng	Pre	OK	Right!	OK	Right!	OK	Right!
Qu-En-Pos	Que	Eng	Post	Bad	Right!	OK	Nope!	Bad	Right!
Qu-Sp-Pre	Que	Span	Pre	OK	Right!	OK	Right!	OK	Right!
Qu-Sp-Pos	Que	Span	Post	OK	Right!	OK	Right!	OK	Right!

Table 13 Results by hypothesis and condition.

predictions and evaluates them according to the results presented above. Note that for the two key predictions, highlighted in gray, the T Hypothesis and the C Hypothesis were not borne out. Instead, our results are most compatible with the C+T Hypothesis, replicating our previous results, reported in §3.3 (Ebert & Hoot 2018). The remainder of this section considers the implications of our findings.

7.2 Implications: T Hypothesis

The first hypothesis we considered was that T would determine subject position, a view supported by the traditional view of the EPP as a feature of T, including parameterized versions of the EPP (Alexiadou & Anagnostopoulou 1998). Previous work on word order in code-switching (MacSwan 2004; 2013; Vanden Wyngaerd 2020) has found evidence that the language of the verb (taken by those authors to be the same as the language of T) determines word order in the clause, but our results do not support this hypothesis. The crucial piece of evidence is that this hypothesis predicts a sentence from condition *Th-Sp-Pos* like (23) should be acceptable, which we did not find.

(23) *What does your dad think that *han comprado **tus hermanos** en la tienda?*
have bought your brothers at the store
'What does your dad think that your brothers have bought at the store?'

To interpret this result, recall from §2 that theories of null and post-verbal subjects in Spanish that appeal to the EPP have two basic forms: (i) the EPP is parameterized such that the Spanish EPP is satisfied by V-to-T movement or (ii) the EPP is the same in all languages but Spanish allows a silent or elided pronoun in Spec,TP.

Regarding the first account, it seems reasonable to expect that post-verbal subjects should be allowed any time there is V-to-T movement of a verb with rich agreement morphology (i.e., a Spanish verb). It is difficult to reconcile such an account with our findings, and so we take our experiment as evidence against this understanding of the EPP.

Regarding the second account, we cannot rule out the existence of an expletive *pro* filling Spec,TP in (23) nor a copy of the subject in Spec,TP that is subsequently elided. However, if expletive *pro* is part of the Spanish lexicon, it could be present in any of our sentences, as could an ellipsis operation that deletes the higher copy of the subject in Spec,TP. We see no reason to expect that these solutions would apply only when both C and T are in Spanish. That is, if *pro* is available in the lexicon, why can't it be inserted to salvage sentences with post-verbal subjects when only T or only C is in Spanish? Likewise, if it is possible to copy the subject to Spec,TP to satisfy the EPP and then elide it at PF, why should that only apply to some code-switched sentences and not all? For this reason, we interpret our results as pointing away from these explanations as well.

7.3 Implications: C Hypothesis

One of the most straightforward predictions regarding the role of C, González-Vilbazo and López's (2012) Phase Head Hypothesis, does not find support in our data. Previous evidence

from code-switching has also pointed away from this hypothesis (Ebert & Hoot 2018; Sande 2018; Vanden Wyngaerd 2020). The crucial piece of evidence against the C hypothesis is *Qu-En-Pos* sentences like (24), which were predicted to be acceptable but were not.

(24) **Qué piensa tu padre que* have bought **your brothers** at the store?
what thinks your dad that
'What does your dad think that your brothers have bought at the store?'

Similarly, we contend that our data is evidence against the initial version of Feature Inheritance introduced by Chomsky (2008), although this concept is much more nebulous and harder to evaluate. Recall that Chomsky explains FI thus: "…for T, phi-features and Tense appear to be derivative, not inherent: basic tense and also tense-like properties (e.g., irrealis) are determined by C…. In the lexicon, T lacks these features" (Chomsky 2008: 143) Our understanding of Chomsky's proposal is that T is mostly empty of formal features, and when C is merged it copies to T features that include Tense itself, along with phi-features and the EPP (whatever form that takes).

Accordingly, T must inherit its features from C even when there is a code-switch between C and T, despite the two heads surfacing in different languages, given the ample evidence that such switches are possible. In those cases, on the assumption that the apparent language of C reflects its features, English C will cause T to inherit a different set of features than Spanish C. When C is English and T Spanish, English C copies its EPP feature requiring a pre-verbal subject (among other features) to T, predicting only pre-verbal subjects. So far, so good. The problem emerges when C is Spanish and T English, as in (24), which similarly disallow post-verbal subjects. If the EPP feature that requires pre-verbal subjects is inherited from C, where does it come from in this case? Our data seems to point to an English T that has an EPP requirement despite being selected by a C which presumably does not. If T has an EPP without inheriting from C, we take our results to run counter to such a version of FI.

Finally, another proposal that focuses on the role of C is that of Pesetsky and Torrego (2001), who argue that the difference between Spanish and English turns on the difference between complementizers in the two languages. Unfortunately, their proposal does not provide a complete treatment of the Spanish facts (Pesetsky and Torrego include Spanish in the paper to contrast it with English and support the broader argument, but their focus is not on Spanish) and so we are unable to fully evaluate it. Nonetheless, although it hinges on differences in the C head, because it still focuses on the ways C and T interact, further exploration of this option could prove fruitful.

7.4 Implications: C+T Hypothesis

In §4, we made predictions following Sande's (2018) account because it is the most explicit relevant hypothesis we are aware of, and our results are consistent with her proposal. Recall that for null subjects, Sande contends that they must be licensed by two different types of features: syntactic licensing from T and discursive licensing from C. This view is compatible with a theory that places the EPP entirely on T, as most traditional approaches do, while reconciling it with the code-switching facts, including ours, supporting a role for C. Given that (certain types of) post-verbal subjects are only felicitous under certain discourse conditions, it seems sensible to extend her account and postulate some discourse feature that is required to license post-verbal subjects. It seems equally sensible to locate such a feature in the C-domain, which has long been linked to discourse functions.

Accepting this approach suggests possible avenues for future work in code-switching. If the availability of post-verbal and null subjects in Spanish/English code-switching depends on two types of features, it would be valuable to examine language pairs with different feature arrangements. For example, consistent verb-initial languages like Celtic, Mayan, and Austronesian languages do not require discourse licensing of post-verbal subjects (Clemens & Polinsky 2017; Rouveret 2017). It would be valuable to investigate the distribution of subjects when such languages are combined with languages like English (to examine the locus of the syntactic licensing alone) and languages like Spanish (to examine the role of discourse licensing). Within Spanish/English (or, more broadly, Romance/Germanic) code-switching, it would be valuable to look into different types of post-verbal subjects, some of which are likely tied more

strongly to discourse restrictions than others. For example, subject inversion in matrix questions is taken by many to be obligatory in non-Caribbean Spanish, and subjects of unaccusative verbs canonically appear in post-verbal position, appearing pre-verbally only when marked discursively as topics. In both cases, any proposed role for discourse features from C is likely reduced (or, in the case of unaccusatives, perhaps even reversed, where *pre*-verbal subjects require discursive licensing instead). An experiment testing these cases in code-switching could be a good next step to evaluating Sande's hypothesis.[13] A third possibility, suggested by an anonymous reviewer, would be to use code-switching data to investigate the discourse features of C, whether they are universal, and how they vary across languages. It would be interesting in this regard to combine languages that are highly discourse-configurational, like Hungarian, Basque, Catalan, or Turkish, with languages that instantiate discourse features differently, like English, Spanish, or German.

An alternative explanation to the C+T Hypothesis would be to appeal to certain variations on Feature Inheritance. For example, C and T could both be required to be in Spanish because features are shared simultaneously by the two heads (e.g., Ouali 2008) or because the two heads are exact copies of one another which must thus be in the same language (e.g., Gallego 2014).[14] At the very least, the apparent close relationship we observe between C and T suggests some kind of interaction between the two heads, and it is for this reason that both we (Ebert & Hoot 2018) and Vanden Wyngaerd (2020) have pointed generally in this direction previously. Unfortunately, it remains unclear how FI can be extended to CS, and the field has not yet reached a consensus on many aspects of FI more generally. To craft a viable understanding of the functioning of FI in code-switching and test it against our data would require specific answers to numerous questions which are still debated.

7.5 Other considerations

Several other points merit consideration in interpreting our results.

First, we have largely assumed implicitly that something special is required to license post-verbal subjects, whereas pre-verbal subjects require little explanation. Such a formulation may seem sensible to speakers of canonical SVO languages, and we have argued for the justification of our hypotheses, but from a theory-internal perspective, it is curious. After all, the EPP, motivating pre-verbal subjects, is the special stipulation that Chomsky (2008: 156) called "an annoying problem" requiring justification. Yet our data suggest the opposite: post-verbal seems to be the special case, only available under certain circumstances, while subjects must be pre-verbal when either C or T alone is in English. Perhaps an alternative analysis focused on the English EPP could be fruitful; we leave that for future work.

Alternatively, perhaps the default or canonical nature of pre-verbal subjects is the reason we observe "English-like" behavior when we have either English C or English T. Given that code-switching between C and T is rare, perhaps our participants default to SVO, which is canonical in both languages, simply because they are less sure. Another similar idea would be to posit that perhaps subjects are always pre-verbal when the switch is between C and T because pre-verbal subjects are common to both languages, while post-verbal subjects are available only in Spanish. Indeed, this idea is a longstanding one in the code-switching literature, dating at least to Poplack's (1980) Equivalence Constraint.

Finally, we should recognize potential design limitations of our study. For instance, we felt that increasing the number of code-switches would make our stimuli even more contrived, so there was always a single switch just before or just after the complementizer. Consequently, a given sentence type always started in Spanish and ended in English or vice versa. One potential

13 Not as relevant to our discussion of pre- and post-verbal subjects but pertaining to Sande's hypothesis more broadly is the value of testing her proposal with other types of null subject languages, of which there are a large variety with different properties (see Holmberg 2005). If Spanish subjects require both a discourse feature and a syntactic feature to be null, what happens when Spanish is combined with Finnish, which is similar except that a third-person subject pronoun cannot (generally) be dropped? What happens if Spanish is combined with Chinese, Japanese or Korean, which allow much more extensive deletion of arguments for discourse reasons?

14 It might seem that a copying approach to Feature Inheritance would rule out code-switching entirely—how can two copies of the same lexical item surface in two apparently different languages?—but such an approach must already find a solution for this problem, given that the phonological form of C and T are invariably different even in monolingual sentences.

confound is that the sentences with Spanish C+T that were rated high regardless of subject position always began with an English matrix clause, including an English *wh*-question, so perhaps there is an effect of the matrix clause. However, the sentences with English C and Spanish T, which were not rated as high, had the same matrix clauses.

8 Conclusions

We have addressed core theoretical questions in the literature on Spanish subject position using a novel source of data: Spanish/English code-switching. The results of our experiment suggest that post-verbal subjects are only possible when both the complementizer (C) and tense (T) heads of the clause are in Spanish, while all other combinations of C and T require pre-verbal subjects. We argued that this finding suggests that what determines subject position in our data is neither the C head nor the T head alone, which calls into question traditional formulations of Feature Inheritance and of the EPP.

Our findings echo those of Sande (2018), and we thus take them to find support for her C+T Hypothesis, under which both heads are required to license null subjects because T must have an appropriate syntactic feature and C must have an appropriate discursive feature. We extended her conclusion to pre- and post-verbal subjects, finding that this explanation fit well with the experimental evidence.

Although ample work remains to be done, our findings add to a line of research from code-switching and monolingual data showing some sort of close relationship between C and T in determining the properties of the clause as a whole. Yet many details of this relationship remain nebulous. Future work on the features of C and T, Feature Inheritance, and/or subject position should take our findings and other evidence from code-switching into account. Code-switching, like all forms of natural language, can and should form part of the empirical core of linguistic theory.

Abbreviations

ACC = accusative, AUX = auxiliary, DAT = dative, DEF = definite, PST = past

Additional files

The additional files for this article can be found as follows:

- **Supplementary File 1.** Appendix: Mean ratings and response distribution for code-switching stimuli. DOI: *https://doi.org/10.5334/gjgl.1449.s1*
- **Supplementary File 2.** Full data set, available at *https://osf.io/w4ksm/*. DOI: *10.17605/OSF.IO/W4KSM*

Ethics and consent

This human subjects research was performed in accordance with the Declaration of Helsinki. The project was approved by the Institutional Review Board of DePaul University (protocol #BH101716MOL). Participants gave informed consent to participate in the study and were compensated fairly for their time.

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Competing interests

The authors have no competing interests to declare.

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