

Asymmetrical p-stranding: Acceptability data from Spanish-English code-switching

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Abstract

This study investigates the availability of preposition stranding (p-stranding) in intrasentential code-switching (CS) among US heritage speakers of Mexican Spanish. P-stranding is allowed in English, but in Spanish the preposition is traditionally pied-piped with the DP. Law (2006) argues Spanish is subject to a syntax-morphology-interface condition, which prevents the extraction of a DP from a PP due to D-to-P incorporation. Previous research has suggested that such incorporation depends upon the features inherent to the preposition, with p-stranding only accepted with Spanish-to-English switches (Koronkiewicz, 2022). We expand on that study since it only included one preposition (*with/con*). Furthermore, it did not explicitly test pied-piping, nor did it include matrix wh-questions, a common context for p-stranding. Results from a written acceptability judgment task show that the participants: (i) dispreferred p-stranding in Spanish compared to pied-piping; and accepted p-stranding in English more than pied-piping. As for CS, they dispreferred p-stranding for English-to-Spanish compared to pied-piping, while for Spanish-to-English it was the inverse. Overall, these asymmetrical p-stranding results align with previous findings (Koronkiewicz, 2022) further suggesting that it is the language of the preposition that dictates incorporation.

Keywords: code-switching, bilingualism, preposition stranding, Spanish, pied piping.

1. Introduction

Preposition stranding (p-stranding) is a linguistic phenomenon whereby determiner phrases (DPs) are extracted from prepositional phrases (PPs), leaving the preposition stranded. Following a minimalist generative approach to syntax (Chomsky, 1995), we assume that in the matrix wh-question in (1), for example, the DP ‘what money’ has been extracted from the PP, leaving behind a trace, and stranding the preposition ‘with’ at the end of the sentence. In pied-piping, on the other hand, the entire PP is moved. In the similar wh-question in (2), for example, the entire PP ‘with what money’ is moved, leaving only the trace. Not all languages exhibit both p-stranding and pied-piping—Spanish, for example, canonically allows for pied-piping (3), but not for p-stranding (4).¹

- (1) [DP What money]_i did you buy it [PP with *t_i*]?
 (2) [PP With [DP what money]]_i did you buy it *t_i*?
 (3) ¿[PP Con [DP qué dinero]]_i lo compraste *t_i*?
 with what money it bought.2SG
 ‘With what money did you buy it?’
 (4) */? ¿[DP Qué dinero]]_i lo compraste con *t_i*?
 what money it bought.2SG with
 ‘What money did you buy it with?’

Code-switching (CS) is generally defined as the use of two (or more) languages within the same discourse. For our purposes, we are interested in intra-sentential CS, which is when the two languages are used within the same clause. For example, consider the sentence in (5) where both Spanish and English are used.

- (5) *Compramos el* car with the savings *que teníamos*.²
 bought.1PL the that had.1PL
 ‘We bought the car with the savings that we had’

Considering the asymmetry between Spanish and English with regards to p-stranding and the ability for Spanish-English bilinguals to CS, a potential conflict

¹ Some studies have found that heritage speakers of Spanish accept and produce p-stranding in Spanish (Pascual y Cabo & Soler, 2015). Campos (1991) also argues that, unlike regular prepositions such as *con* ‘with’, p-stranding is possible in Spanish with substantive prepositions like *encima* ‘on’. In this paper, we focus exclusively on regular prepositions.

² Whenever necessary, CS examples will differentiate between the two languages by having Spanish notated using italics and English with a non-italicized font.

arises: What is the availability of p-stranding and pied-piping in intra-sentential Spanish-English CS? For example, is it possible to extract a Spanish DP out of an English PP (6)? Or vice versa, an English DP out of a Spanish PP (7)? And, relatedly, is pied-piping still available with an all-Spanish PP in an otherwise all-English sentence (8) or vice-versa (9)?

- (6) ¿[_{DP} *Qué dinero*]_i did you buy it [_{PP} with *t_i*]?
 what money
 ‘What money did you buy it with?’
- (7) [_{DP} What money]_i *lo compraste* [_{PP} *con t_i*]?
 it bought.2SG with
 ‘What money did you buy it with?’
- (8) ¿[_{PP} *Con* [_{DP} *qué dinero*]]_i did you buy it *t_i*?
 with what money
 ‘With what money did you buy it?’
- (9) [_{PP} With [_{DP} what money]]_i *lo compraste t_i*?
 it bought.2SG
 ‘With what money did you buy it?’

Previous work by Koronkiewicz (2022) provided evidence that p-stranding is indeed available in Spanish-English CS, though it was affected by the age of acquisition of English by the speaker and direction of the switch: Simultaneous bilinguals accepted every instantiation of p-stranding, whether in Spanish, English or CS (in both directions); on the other hand, early sequential bilinguals only accepted p-stranding in English, and when the switch direction was from Spanish-to-English (e.g., [6]). That study, though, looked only at p-stranding with one preposition pair, *with/con*, in embedded wh-questions. In the present paper, we are expanding on Koronkiewicz (2022) in three specific ways to better understand how this phenomenon works in Spanish-English CS: (i) testing both p-stranding and pied-piping; (ii) testing a variety of lexical prepositions pairs (i.e., *of/de*, *to/a*, and *with/con*); and (iii) testing the three different syntactic constructions where p-stranding can occur, including matrix wh-questions, embedded wh-questions, and relative clauses.

Our current results partially contradict previous findings, as the age of acquisition did not play a role, as all current participants (i.e., simultaneous and early sequential Spanish-English bilinguals) exhibited a distinction between the two languages, only accepting p-stranding in English. Otherwise, though, the results align with previous research, as they accepted p-stranding in CS only when switching from Spanish-to-English (6), suggesting that it is the language of the preposition that drives incorporation of a determiner (which would block such stranding). Importantly, this acceptability did not significantly vary based on syntactic structure or specific lexical preposition, suggesting that the pattern seems to be generalized. As for pied-piping, it was also allowed in CS, with acceptability in both directions; however, there was a preference for it in English-to-Spanish switches, which mirrored the overall preference for it in monolingual Spanish as compared to monolingual English.

2. Literature Review

2.1. Code-switching data as a linguistic tool

While CS has long been recognized as a prevalent phenomenon in bilingual speech (e.g., Gumperz, 1967, 1970, 1977), its systematic study has recently continued to gain traction. It has now emerged as a valuable linguistic tool for investigating many different facets of language. CS entails the seamless alternation between two or more languages within the same discourse, and as such, its inclusion in linguistic research has led to countless new sources of data that not only *can* but *should* be included in shaping our broader understanding of how languages work. Similar work using such an approach has targeted: pronouns (González-Vilbazo & Koronkiewicz, 2016; Koronkiewicz, 2014), wh-questions (Ebert, 2014), pro-drop (Sande, 2018), causatives (González-Vilbazo & López, 2012), sluicing (González-Vilbazo & Ramos, 2018), and more.

Theoretical approaches to linguistics initially concerned themselves with monolingual data. Although much of this research focused on cross-linguistic comparisons, building theories that could account for data from a variety of different languages, there was little emphasis on looking at how these theories could be applied to when those languages were mixed. If the goal of theoretical linguistics is to develop formal models and frameworks that explain the universal properties and mechanisms underlying human language, we should ensure that they do not only account for when those languages are in isolation. Given our plurilingual world, as Gardner-Chloros (2009) puts it, “it seems sensible that linguists should derive their data and evidence from the most typical speakers rather than from more exceptional ones” (p. 5).

Part of the broader field of language contact studies, this research aims to investigate the dynamic interactions that occur when different languages come into contact. This particular study sees its broadest, overarching goal as better understanding the syntax of language mixing—that is to say, what are the linguistic factors that contribute to structural constraints on CS? By doing so, this study also aims to better inform general syntactic theory. This is possible because one of the distinctive features of CS data is its capacity to unveil underlying mechanisms that may be hidden in monolingual contexts (see González-Vilbazo et al., 2013 for further discussion). In the present paper, we provide one specific example of this ability, using CS data regarding p-stranding to tap into linguistic mechanisms that are opaque in monolingual contexts.

2.2. P-stranding and pied-piping in English and Spanish

In p-stranded sentences, the complement of the prepositional phrase (PP) is extracted to a higher syntactic position (generally identified as the specifier position of the Complementizer Phrase [Chomsky, 1986]) due to wh-movement, leaving the preposition stranded in its lower position. Languages differ when it comes to licensing p-stranding. In English, p-stranding is permissible (Law, 2006; Salles, 1995), where it can occur in matrix wh-questions (10), embedded wh-questions (11), and relative clauses (12). Pied-piping, on the other hand, refers to cases where the complement of the PP is moved together with the wh-word (13). Although permissible in English,

sentences like those in (13) are usually used prescriptively and/or in formal discourse (Biber et al., 1999).

- (10) [DP What country]_i did you travel [PP to *t_i*].
- (11) I don't know [DP what airline]_i he flew [PP with *t_i*].
- (12) John is the friend [DP who]_i he went traveling [PP with *t_i*].
- (13) [PP To [DP what country]]_i did you travel *t_i*?

In Spanish, on the other hand, p-stranding is canonically unacceptable (14), as the preposition must be pied-piped (Law, 2006). This is true for matrix wh-questions (15), embedded wh-questions (16), and relative clauses (17).

- (14) * ¿[DP Qué amigo]_i viajaste [PP con *t_i*]?
 what friend traveled.2SG with
 'What friend did you travel with?'
- (15) ¿[PP Con [DP qué amigo]]_i viajaste *t_i*?
 with what friend traveled.2SG
 'With what friend did you travel?'
- (16) No sé [PP con [DP qué aerolínea]]_i viajaste *t_i*.
 not know.1sg with what airline traveled.2SG
 'I don't know with what airline you traveled.'
- (17) Juan es el amigo [PP con [DP quien]]_i viajaste *t_i*.
 Juan is the friend with who(m) traveled.2SG
 'Juan is the friend with who(m) you traveled.'

According to Law (2006), this cross-linguistic variation is due to the following syntax-morphology interface condition:

- (18) **Syntactic constraint on suppletion**
 Elements that undergo suppletive rules must form a syntactic unit X^0

Law argues that languages that have suppletive determiners, and thus have this constraint, do not license p-stranding, such as Spanish. His argument is as follows. Spanish determiners have the suppletive forms *del* 'of the' (i.e., *de + el*) and *al* 'to the' (i.e., *a + el*). According to Law, the preposition and the determiner form a single syntactic unit that cannot be separated. The configuration would look like the following:

- (19) [PP [P **de**] [DP [D **el**] [NP norte]] → [PP [P+D **del**]_i] [DP [D **t_i**] [NP norte]]]
 of the north of-the north
 'of the north'

This constraint, then, would not permit the DP to move independently from the preposition in a syntactic operation like *wh*-movement—rather, the entire PP must move. Furthermore, Law argues that this constraint applies as an all-or-nothing constraint for languages, even if the specific preposition in question does not have a suppletive form. For example, *con* ‘with’ does not have a suppletive form in Spanish, but *con* + *el* ‘with the’, according to Law, still forms one syntactic unit (20).

- (20) [PP [P **con**] [DP [D **el**] [NP viento]] → [PP [P+D **con el**] [DP [D **ti**] [NP viento]]]
 with the wind with the wind
 ‘with the wind’

English determiners, on the other hand, lack any suppletive forms, and as such, they never incorporate and remain as separate syntactic units. For example:

- (21) [PP [P **of**] [DP [D **the**] [NP north]]]
 (22) [PP [P **with**] [DP [D **the**] [NP wind]]]

As such, separation of the determiner from the preposition is allowed in English, resulting in the availability of *p*-stranding. This is how Law accounts for the variation between Spanish and English.

2.3. P-stranding and code-switching

As far as we know, Koronkiewicz (2022) is the only study that has systematically tested the availability of *p*-stranding in Spanish-English CS. In his study, Koronkiewicz tested 24 Spanish-English bilingual participants. They had all learned both languages from an early age, including simultaneous bilinguals, who reported learning both languages from birth, and early sequential bilinguals, who learned English at age five or beyond. The participants completed an acceptability judgment task (AJT) where they had to judge *p*-stranded sentences in one syntactic context (embedded *wh*-questions) with one preposition pair (*with/con*). Koronkiewicz found that simultaneous bilinguals accepted *p*-stranding in all CS cases, as they also accepted it in both monolingual Spanish and monolingual English. These results suggest that (at least in that specific construction) there is no *D*-to-*P* incorporation in Spanish (23), English (24) or CS (25-26), as the Spanish elements never seem to form one syntactic unit, as evidenced by these bilinguals' ability to *p*-strand in all contexts.

- (23) [PP [P **con**] [DP [D **qué**] [NP amigo]]
 with what friend
 ‘with what friend’
 (24) [PP [P **with**] [DP [D **what**] [NP friend]]]
 (25) [PP [P **with**] [DP [D **qué**] [NP *amigo*]]
 what friend
 ‘with what friend’

- (26) [PP [P *con*] [DP [D **what**] [NP friend]]]
 with
 ‘with what friend’

Early sequential bilinguals, on the other hand, rejected p-stranding in English-to-Spanish CS, but accepted it in Spanish-to-English CS. These results follow from the fact that these bilinguals showed the expected asymmetry between the two languages, and as such, it suggests that the language of the preposition drives D-to-P incorporation. In other words, these results suggest, first, that there is no incorporation when an English proposition is present (24-25), directly mirroring the other bilingual group. However, there does seem to be D-to-P incorporation in scenarios where a Spanish preposition is involved (27-28), which consequently prevents those prepositions from being stranded.

- (27) [PP [P *con*] [DP [D **qué**] [NP amigo]] → [PP [P+D *con qué*_i] [DP [D **t_i**] [NP amigo]]]
 with what friend with what friend
 ‘with what friend’

- (28) [PP [P *con*] [DP [D **what**] [NP friend]] → [PP [P+D *con what*_i] [DP [D **t_i**] [NP friend]]]
 with with
 ‘with what friend’

Missing from this experiment are other syntactic constructions in which p-stranding can occur, such as matrix wh-questions and relative clauses, as well as with other prepositions, namely *to/a* and *of/de*. Recall that Law’s (2006) syntactic constraint on suppletion states that p-stranding is present in languages that have D-to-P incorporation (i.e., suppletion). In Koronkiewicz (2022), the only preposition that was used was *with/con*, which does not have a suppletive form. It is therefore imperative that we include prepositions that do have a suppletive form (i.e., *to/a* and *of/de*), so that we can directly test Law’s constraint. If there is variation based on the specific preposition, this could provide evidence that the all-or-nothing approach to the constraint needs to be revised. The current paper, then, is an extension of Koronkiewicz (2022), where we include the missing structures, as well as the prepositions with suppletive forms in Spanish (*to/a* and *of/de*). By expanding both the lexical items and the structures, we can gain a more complete understanding of how Law’s analysis aligns with language mixing data. Moreover, by including pied-piping as well, we will gain more insight into this phenomenon that varies between Spanish and English.

2.4. Research questions

In this article, we follow a generative approach to CS (Grimstad, et al., 2018; MacSwan, 1999), which assumes that there are no special mechanisms that function only in CS (i.e., a third grammar). Rather, the constraints that are present in CS sentences are due to a mismatch of features in the interaction of both languages, which parallels what occurs in monolingual contexts, negating the need for special CS rules.

Taking all this into consideration, the following are our research questions (RQs):

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- RQ 1: Do US heritage speakers of Spanish accept p-stranding in Spanish-English CS in either direction?
- RQ 1a: Does it vary by structure? (i.e., matrix wh-questions, embedded wh-questions, relative clauses)
- RQ 1b: Does it vary by the lexical preposition? (i.e., with/*con*, a/to, de/of)
- RQ 2: Do US heritage speakers of Spanish accept pied-piping in Spanish-English CS in either direction?
- RQ 2a: Does it vary by structure? (i.e., matrix wh-questions, embedded wh-questions, relative clauses)
- RQ 2b: Does it vary by the lexical preposition? (i.e., with/*con*, a/to, de/of)
- RQ 3: Does age of acquisition of English play a role in the p-stranding acceptability in the Spanish of heritage speakers?

Based on the results of Koronkiewicz (2022) and the analysis proposed by Law (2006), our hypotheses are the following:

- Hypothesis 1: For bilinguals who do not p-strand in monolingual Spanish, p-stranding will also be accepted with Spanish-to-English switches (i.e., a Spanish DP extracted from an English PP), and it will be rejected when the switch is in the other direction.
- Hypothesis 1a: P-stranding acceptability will not vary by structure.
- Hypothesis 1b: P-stranding acceptability will not vary by lexical preposition.
- Hypothesis 2: There will be no restriction regarding pied-piping in Spanish-English CS.
- Hypothesis 2a: pied-piping acceptability will not vary by structure.
- Hypothesis 2b: pied-piping acceptability will not vary by lexical preposition.
- Hypothesis 3: Based on previous findings, age of acquisition of English will play a role whereby simultaneous bilinguals will accept every instantiation of p-stranding, while early sequential bilinguals will only accept p-stranding in English.

3. Methods

3.1. Participants

The participants in the study were all US heritage speakers of Mexican Spanish ($N = 21$) living in north/central Illinois. They were either born in the US or moved there at a young age, and at the time of data collection, their ages were between 19 and 38 ($M = 29.0$ years, $SD = 5.3$). With regard to their language background, they learned both languages early in their childhood, with Spanish ($M = 0.4$ years, $SD = 1.2$) being acquired on average earlier than English ($M = 2.5$ years, $SD = 2.5$). All participants

had an intermediate/advanced level of Spanish ($M = 38.3$ out of 50, $SD = 7.1$) and an advanced level of English ($M = 36.2$ out of 40, $SD = 2.3$) based on respective multiple-choice, vocabulary-and-grammar-based proficiency measures (Montrul & Slabakova, 2003; O'Neill et al., 1981). Their scores on the Bilingual Language Profile (BLP; Birdsong et al., 2012) indicated they were overall slightly English dominant ($M = 40.2$ out of ± 218 , $SD = 5.3$). More detailed information regarding the participants' language dominance and proficiency is provided in Table 1.

Table 1. Participant language dominance and proficiency

Participant	Spanish proficiency			English proficiency			Dominance
	Vocab & Grammar	LDT	Self	Vocab & Grammar	LDT	Self	BLP
1	47.0	52.0	5.8	37.0	96.3	5.3	-62.6
2	45.0	42.0	6.0	38.0	96.3	5.5	-8.9
3	37.0	0.0	5.3	34.0	80.0	6.0	-4.0
4	45.0	35.0	5.0	37.0	83.8	5.0	7.4
5	31.0	5.0	5.0	36.0	93.8	6.0	20.0
6	43.0	12.0	4.8	36.0	75.0	6.0	23.2
7	32.0	-1.0	5.3	37.0	86.3	6.0	25.4
8	41.0	12.0	5.3	37.0	75.0	6.0	30.0
9	38.0	32.0	4.5	31.0	77.5	5.3	32.2
10	45.0	17.0	3.5	37.0	96.0	5.3	37.4
11	41.0	12.0	5.0	35.0	75.0	6.0	40.5
12	47.0	47.0	5.3	37.0	100.0	5.8	41.5
13	36.0	4.0	3.3	38.0	87.5	5.8	42.9
14	41.0	11.0	3.0	35.0	91.3	5.0	47.3
15	45.0	41.0	4.5	39.0	98.8	6.0	57.4
16	37.0	17.0	3.3	37.0	96.3	5.3	61.0
17	35.0	12.0	5.3	38.0	75.0	6.0	69.4
18	22.0	10.0	3.5	30.0	88.8	5.5	73.7

19	37.0	24.0	3.3	37.0	98.8	5.5	78.5
20	37.0	44.0	4.0	36.0	91.3	6.0	102.6
21	22.0	12.0	3.0	39.0	75.0	6.0	128.0
<i>M</i>	38.3	21.0	4.5	36.2	87.5	5.7	40.1
<i>SD</i>	7.1	16.5	1.0	2.3	9.3	0.4	40.6

Note: The vocabulary and grammar test for Spanish (Montrul & Slabakova, 2003) was scored from 0 to 50, while for English (O’Neill et al., 1981) it was scored from 0 to 40. The lexical decision task (LDT) for Spanish (Lextale-Esp; Izura et al., 2014) was scored from -60 to 60, while for English (LexTALE; Lemhofer & Broersma, 2011) it was scored from 0 to 100. The self-ratings for both languages were scored from 0 to 6, which were taken from an average of four questions from the BLP (Birdsong et al., 2012), where 0 was labeled *not well at all* and six was labeled *very well* for ability to speak, understand, read, and write. The BLP also provided the language dominance score, which ranged from -218 to +218, where a more positive score indicated more English dominance.

3.2. Task

The experimental task consisted of a series of written AJT³s that targeted either code-switched sentences or sentences entirely in English or Spanish. All sentences being judged by the participants were presented one at a time with a 7-point Likert scale. Each point on the scale was labeled as follows in either English or Spanish: 1 = *Completely unacceptable / Completamente inaceptable*, 2 = *Mostly unacceptable / Mayormente inaceptable*, 3 = *Somewhat unacceptable / Un poco inaceptable*, 4 = *Unsure / No sé*, 5 = *Somewhat acceptable / Un poco aceptable*, 6 = *Mostly acceptable / Mayormente aceptable*, 7 = *Completely acceptable / Completamente aceptable*. The scale was always presented with the English question *How acceptable is this sentence?* or the Spanish question *¿Qué le parece esta oración?*⁴ The monolingual AJTs included their respective labels and question, while the CS AJT always presented the labels in English and the question in Spanish. A sample item for the CS AJT is provided in Figure 1. The participants had as much time as they wished to provide their response; however, once they moved on to the next sentence they were not allowed to backtrack.

³ Since this paper is an extension of Koronkiewicz (2022), which used AJTs as the task, we decided to also use AJTs. There are, however, other tasks that are also frequently used, such as the two-alternative forced choice (2AFC) task (Stadthagen et al., 2018; Stadthagen et al., 2019). Future work should include the 2AFC task for a more robust understanding of p-stranding and pied-piping.

⁴ A reviewer pointed out that the difference in the translation between the English and Spanish version of this question might prompt the participant to judge the sentences differently depending on which version they saw. However, in the training portion of the experiment, both versions were used interchangeably throughout various examples. Because of this, we believe that the participants interpreted the two questions as being the same.

Figure 1. Sample CS AJT item

Con qué hombre is Ashley dancing?

	Completely unacceptable	Mostly unacceptable	Somewhat unacceptable	Unsure	Somewhat acceptable	Mostly acceptable	Completely acceptable
¿Qué le parece esta oración?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

>>

3.3. Stimuli

The target stimuli ($N = 36$) were all code-switched sentences which were evenly divided between the two conditions: p-stranding and pied-piping. Within each of the conditions, there were six sentences for each of the three syntactic structures where p-stranding can occur: matrix wh-questions, embedded wh-questions, and relative clauses. Of those six sentences, half were switches from Spanish-to-English and half were from English-to-Spanish, with the different lexicalizations being centered around the following prepositions: with/*con*, of/*de*, and to/*a*. Sample CS stimuli are provided in Table 2.

Table 2. Target CS stimuli

	English-to-Spanish		Spanish-to-English	
	P-stranding	Pied-piping	P-stranding	Pied-piping
Matrix wh-	What guy <i>está bailando Araceli con</i> ?	With what guy <i>está bailando Araceli</i> ?	<i>Qué hombre</i> is Ashley dancing with?	<i>Con qué hombre</i> is Ashley dancing?
Embedded wh-	Emily doesn't know what friend <i>Fernando está trabajando con</i> .	Emily doesn't know with what friend <i>Fernando está trabajando</i> .	<i>Elisa no sabe qué amigo</i> Frank is working with.	<i>Elisa no sabe con qué amigo</i> Frank is working.
Relative clause	United is the company <i>Roberta está volando con</i> .	United is the company with which <i>Roberta está volando</i> .	<i>United es la compañía que</i> Ruby is flying with.	<i>United es la compañía con la que</i> Ruby is flying.

Also included were monolingual comparison stimuli ($N = 36$) that were all Spanish or English sentences that were similarly divided between the two conditions, three structures, two switch directions, and six lexical prepositions. Sample monolingual stimuli are provided in Table 3.

Table 3. Comparison monolingual stimuli

	English		Spanish	
	P-stranding	Pied-piping	P-stranding	Pied-piping
Matrix wh-	What guy is Ashley dancing with?	With what guy is Ashley dancing?	Qué hombre está bailando Araceli con?	Con qué hombre está bailando Araceli?
Embedded wh-	Emily doesn't know what friend Frank is working with.	Emily doesn't know with what friend Frank is working.	Elisa no sabe qué amigo Fernando está trabajando con.	Elisa no sabe con qué amigo Fernando está trabajando.
Relative clause	United is the company Ruby is flying with.	United is the company with which Ruby is flying.	United es la compañía que Roberta está viajando con.	United es la compañía con la Roberta está viajando.

3.4. Procedure

There were two portions of the study that participants completed, which were done on different days. The first portion was a 5-10 minute Qualtrics survey that first included a consent form and then two lexical decision tasks: the LexTALE (Lemhöfer & Broersma, 2012) and the LexTALE-Esp (Izura et al., 2014). The final portion of this first survey included 11 questions about their language background and experience and attitudes about language mixing. This information was used to ensure that participants qualified for the second portion of the study. Since they were all self-reported early Spanish-English bilinguals and code-switchers, all participants qualified. They also all confirmed that they had either positive or neutral attitudes toward CS, indicating that their language attitudes would not have an unintended, negative consequence on the acceptability judgments (Badiola et al., 2018).

The second portion of the study was another longer Qualtrics survey that took about 60-80 minutes to complete. After filling out another consent form, participants went through a short training session regarding how to complete a written Acceptability Judgment Task (AJT). Following the methodological recommendations by González-Vilbazo et al. (2013), these instructions were written in a mixture of Spanish and English, as an attempt to prime the participants into bilingual mode and to implicitly show how CS is a perfectly valid language practice. The instructions of the training centered on ensuring that participants were providing judgments based on the “the linguistic structures that [they] have in [their] mind as a bilingual speaker,”

and not based on other restrictions related to prescriptive rules, pragmatics, and so on. It also included various practice sentences for them to complete before moving on to the actual task. After completing the training session, participants completed a small AJT block of CS judgments ($N = 24$) for a separate project, followed by the first two sections of the Bilingual Language Profile (Birdsong et al., 2012). This was followed by a larger AJT block of CS judgments ($N = 78$), which included the target stimuli for the current study ($N = 36$), which were completely randomized for each participant among various distractor items, including adjective switches ($N = 8$), adverb switches ($N = 12$), direct object switches ($N = 16$), and adjunct prepositional phrase switches ($N = 6$). This block was followed by a vocabulary and grammar proficiency measure for Spanish (Montrul & Slabakova, 2003), which in turn was followed by the block of monolingual Spanish AJT judgments ($N = 39$). In a parallel fashion, the participants then completed a similar proficiency measure for English (O'Neill et al., 1981), which was followed by the block of monolingual English AJT judgments ($N = 39$). Finally, participants completed the third and fourth sections of the Bilingual Language Profile, after which the study procedure was completed. Each participant was compensated \$20 for their time via Amazon electronic gift codes.

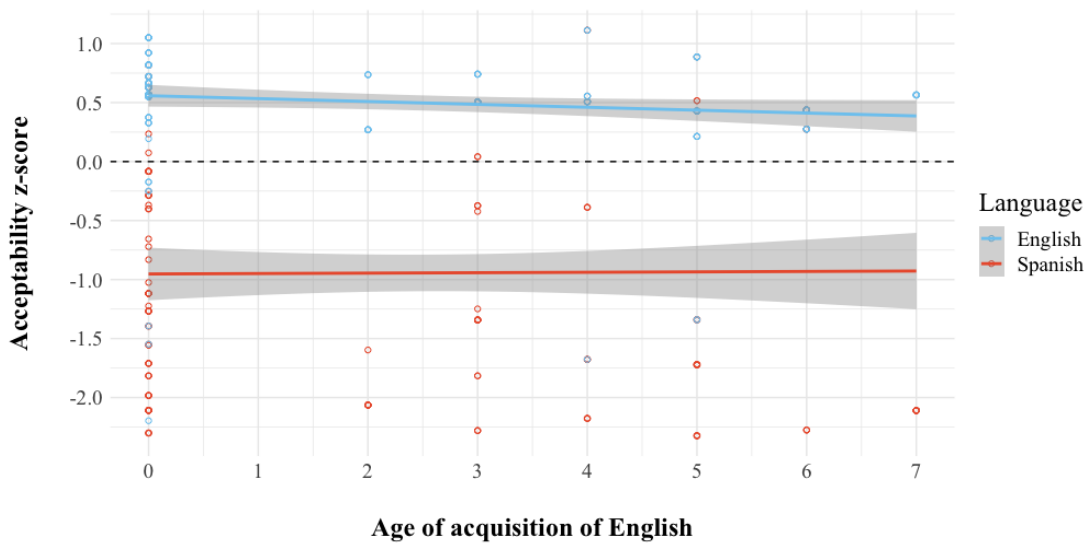
3.5. Analysis

The data was analyzed using R Studio, using the `dplyr`, `ggplot2`, and `tidyr` packages. After exporting the data from Qualtrics, the acceptability scores provided by participants were standardized, converting them into z-scores, following the pre-processing recommendations of Schütze and Sprouse (2014). For each of the research questions and sub-questions, repeated measures ANOVA were used with participant as a random effect and stimulus as a within-subject variable.

4. Results

4.1. Age of acquisition of English

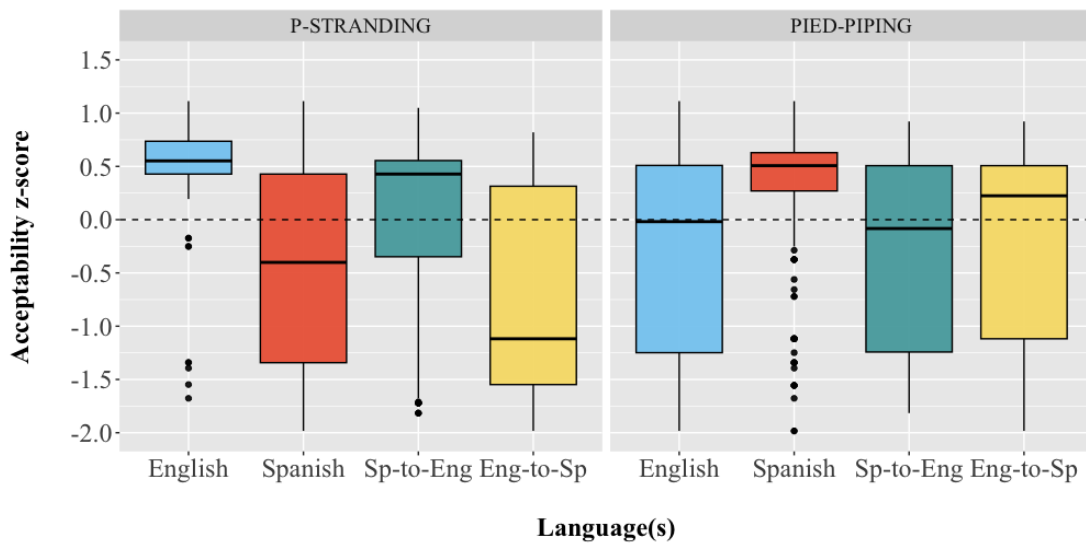
We first answer the 3rd RQ that asks if age of acquisition of English plays a role in the acceptability of p-stranding in the Spanish of heritage speakers. Given that previous research has shown differences in p-stranding availability in the Spanish of heritage speakers, it is important to look at the results with regard to what age the participants were first exposed to English. Recall that in prior studies, simultaneous bilinguals were shown to accept p-stranding in Spanish, just like in English, diverging from what is expected in Spanish more generally. Early sequential bilinguals, however, have shown the expected distinction between the two languages. As can be seen in Figure 2, the heritage speakers who participated in the study show essentially no variability with regard to p-stranding in Spanish, as the acceptability ratings provided are consistently low ($M = -0.94$, $SD = 1.08$) compared to the English p-stranding ratings ($M = 0.50$, $SD = 0.45$).

Figure 2. Relationship between age of acquisition of English and p-stranding acceptability

A repeated measures ANOVA with participant and stimulus as within-subject variables showed a significant effect for language ($p < 0.001$) but not age of exposure to English ($p = 0.701$). In other words, the simultaneous bilinguals rejected p-stranding in Spanish just like the early sequential bilinguals. Given these findings, for the remainder of the results, all participants will be grouped together.

4.2. General overview

To answer the primary research questions, we can look at the overall ratings for p-stranding and pied-piping in the various language conditions. These results are shown in Figure 3. As can be seen, first, there was the expected distinction in Spanish between p-stranding and pied-piping, with the former receiving consistently lower ratings ($M = -0.94$, $SD = 1.08$) than the latter ($M = 0.27$, $SD = 0.67$). English, on the other hand, showed the inverse pattern, with the p-stranding sentences receiving higher scores ($M = 0.50$, $SD = 10.45$) than the ones with pied-piping ($M = -0.58$, $SD = 1.09$). When it comes to CS, the p-stranding patterns match the language of the preposition, as p-stranding was rated much higher in Spanish-to-English sentences ($M = -0.03$, $SD = 0.85$) than in English-to-Spanish sentences ($M = -1.00$, $SD = 1.03$). With regard to pied-piping, the sentences were rated quite similarly, although English-to-Spanish sentences did receive slightly higher ratings ($M = -0.32$, $SD = 0.97$) compared to Spanish-to-English sentences ($M = -0.55$, $SD = 1.06$).

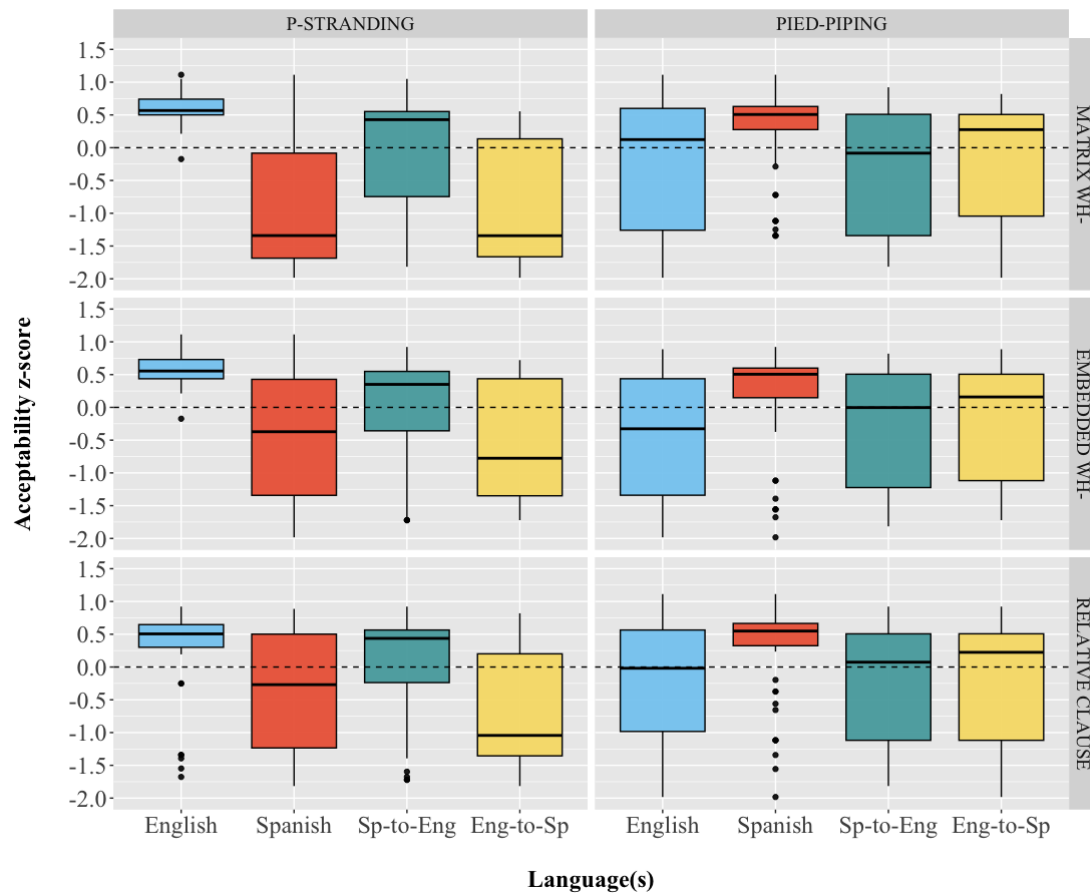
Figure 3. Overall p-stranding and pied-piping acceptability by language(s)

A repeated measures ANOVA with participant as a random effect and stimulus as a within-subject variable showed a significant interaction between language and condition ($p < 0.001$). Post hoc analysis using pairwise t-test comparisons with a Tukey correction showed a hierarchy of acceptability for p-stranding as English / Spanish-to-English > Spanish > English-to-Spanish, while the hierarchy of acceptability for pied-piping was Spanish > English-to-Spanish > English / Spanish-to-English.

Returning to the research questions, with regard to RQ1, the results suggest that US heritage speakers of Spanish do accept p-stranding in Spanish-English CS, but only in switches from Spanish-to-English (i.e., when a Spanish DP is extracted from an English PP). As for RQ2, the results also suggest that they accept pied-piping in Spanish-English CS; the preferred option is with English-to-Spanish switches, however, Spanish-to-English switches were also marginally acceptable with pied-piping (in parallel to monolingual English pied-piping).

4.3. Comparison of different syntactic structures

In order to answer the first sub-questions of each RQ, we need to separate the acceptability judgments into the various structures that the stimuli employed. These results are shown in Figure 4, while all means for each combination are reported in Table 4. As can be seen, the patterns for both p-stranding and pied-piping with matrix wh-questions, embedded wh-questions, and relative clauses follow the same overall pattern discussed in the previous section.

Figure 4. P-stranding and pied-piping acceptability by language(s) and structure**Table 4.** P-stranding and pied-piping acceptability by language(s) and structure

Condition	Language(s)	Matrix Wh-		Embedded Wh-		Relative Clause	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
P-stranding	English	0.56	0.43	0.58	0.24	0.35	0.58
	Spanish	-1.30	0.97	-0.77	1.07	-0.76	1.11
	Sp-to-Eng	-0.09	0.92	-0.03	0.84	0.04	0.80
	Eng-to-Sp	-1.38	0.96	-0.65	0.99	-0.98	1.03
Pied-piping	English	-0.60	1.17	-0.73	1.07	-0.42	1.03
	Spanish	0.30	0.64	0.20	0.72	0.33	0.66
	Sp-to-Eng	-0.55	1.05	-0.55	1.06	-0.54	1.10
	Eng-to-Sp	-0.30	0.97	-0.39	0.99	-0.27	0.95

A repeated measures ANOVA with participant as a random effect and stimulus as a within-subject variable again showed an interaction between language and condition ($p < 0.001$); however, there was no significant main effect for structure ($p = 0.585$), nor any interactions between structure and the other variables ($p > 0.325$). To answer RQ 1a and RQ 2a, overall the (un)acceptability of p-stranding and pied-piping in Spanish-English CS by heritage speakers of Spanish does not vary by structure.

4.4. Comparison of different lexical prepositions

Finally, turning to the second sub-question of each RQ, we need to separate the acceptability judgments into the specific lexical items that appeared as prepositions in the stimuli. These results are shown in Figure 5, while all the means for each combination are reported in Tables 4 and 5. First with regard to the English prepositions (*of*, *to*, *with*), as can be seen, the patterns are quite similar overall.

Figure 5. P-stranding and pied-piping acceptability by language(s) and lexicalization

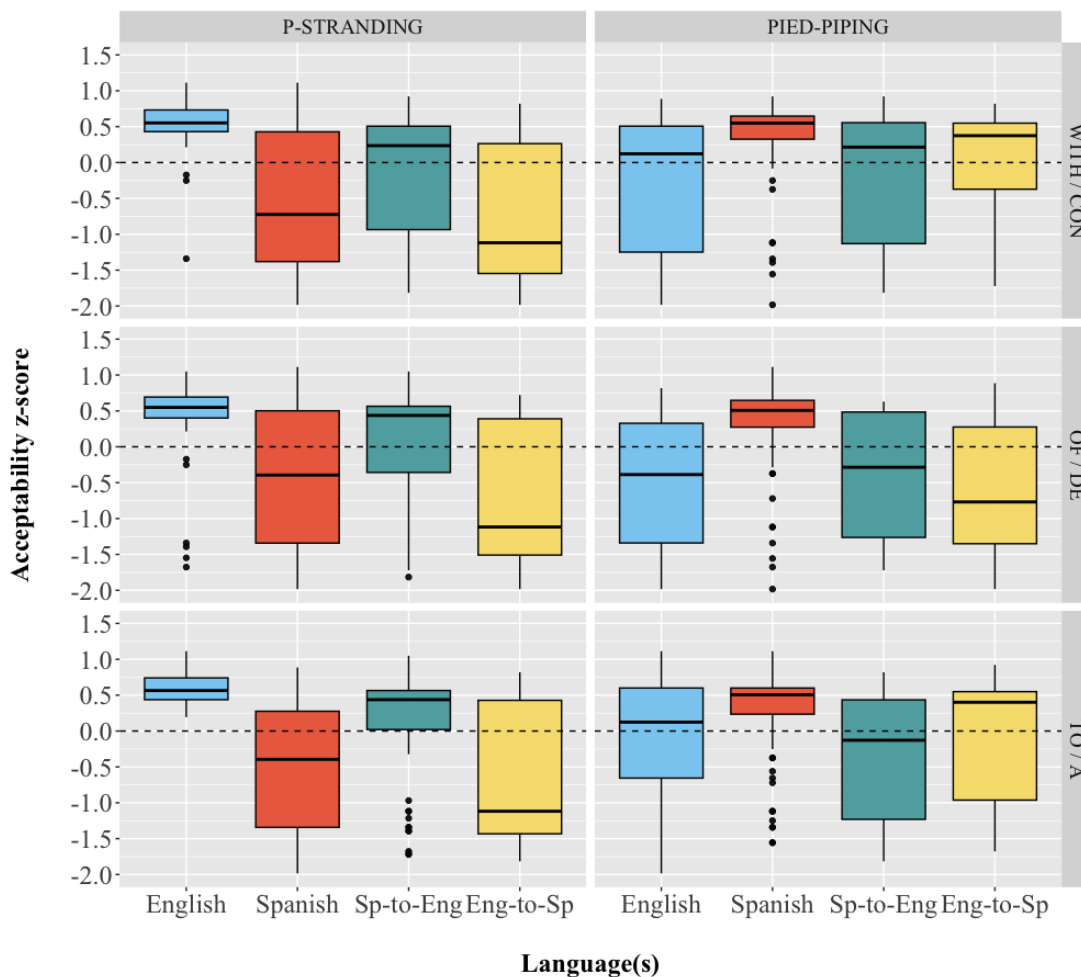


Table 4. English lexical preposition p-stranding and pied-piping acceptability

Condition	Language(s)	<i>with</i>		<i>of</i>		<i>to</i>	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
P-stranding	English	0.48	0.49	0.42	0.56	0.59	0.22
	Sp-to-Eng	-0.20	0.89	-0.02	0.90	0.14	0.75
Pied-piping	English	-0.57	1.11	-0.87	1.08	-0.31	1.03
	Sp-to-Eng	-0.37	1.01	-0.82	1.15	-0.45	0.98

Table 5. Spanish lexical preposition p-stranding and pied-piping acceptability

Condition	Language(s)	<i>con</i>		<i>de</i>		<i>a</i>	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
P-stranding	Spanish	-1.02	1.09	-0.88	1.13	-0.93	1.02
	Eng-to-Sp	-1.14	1.00	-1.05	1.08	-0.82	1.00
Pied-piping	Spanish	0.32	0.66	0.29	0.67	0.21	0.69
	Eng-to-Sp	0.03	0.69	-0.85	1.07	-0.13	0.89

A repeated measures ANOVA with participants as a random effect and stimulus as within-subject variables again showed an interaction between language and condition ($p < 0.001$); however, there was no significant main effect for lexicalization ($p = 0.670$), nor any interactions between lexicalization and the other variables ($p > 0.649$). To answer RQ 1b and RQ 2b, overall the (un)acceptability of p-stranding and pied-piping in Spanish-English CS by heritage speakers of Spanish does not vary by the specific lexical preposition.

5. Discussion

This study explores the interplay of various factors related to p-stranding and pied-piping in Spanish-English CS. In addition to testing these phenomena within the context of mixed utterances, our analysis also includes monolingual sentences in both Spanish and English, providing a more comprehensive look at how bilinguals judge the acceptability of these structures.

The first important take-away from the current study is with respect to the effect of age of acquisition on p-stranding availability in Spanish and its subsequent effect on CS. Recall that Koronkiewicz (2022) found that the age of acquisition of English played a role in acceptability judgments: Early sequential bilinguals (who were exposed to English after Spanish) only accepted p-stranding in monolingual English and Spanish-to-English mixed sentences, while simultaneous bilinguals accepted p-stranding in all monolingual and CS contexts. However, our results showed

that age of acquisition did not impact the results, as the participants patterned similarly regardless of whether or not they were exposed to English earlier or later. Methodologically speaking, this finding is important as it justified collapsing all the participants into one group, while also providing continued justification to include monolingual judgments in CS studies (Ebert & Koronkiewicz, 2018). More generally, though, these results speak to the variability found in bilingual groups, especially among heritage speakers. The participant background for those in the current study is not immediately distinct from that of Koronkiewicz's previous work (i.e., they are all heritage speakers of Spanish in the US with comparable levels of language proficiency, dominance, etc.). Nonetheless, these two groups diverge with regard to the extent to which the p-stranding construction has been extended from English to Spanish. One factor that may be at play here is the speech community, as the current population of speakers was recruited from a narrower geographical region (i.e., northern/central Illinois), whereas the participants in the previous study were not limited to one specific part of the US. Although we only have data for one particular structure (i.e., p-stranding), it is possible that the crosslinguistic influence of English is not as strong in the greater Chicagoland area, as opposed to other regions of the US where heritage speakers of Spanish live and use their two languages. Chicago is home to dense and extensive Spanish-speaking communities that maintain and celebrate linguistic and cultural ties, which may lead to a greater resistance to linguistic assimilation to English compared to other areas in the US that may not have the same kind of linguistic networks for Spanish-English bilinguals (Potowski, 2005; Carreira, 2013; Farr and Guerra, 1995). Additionally, there are plenty of variables that were not assessed with regard to these participants, including socioeconomic factors and/or educational opportunities, which could also be playing a role in the maintenance of Spanish, thereby mitigating the influence of English to some extent. A related but distinct explanation turns to the Spanish input received in childhood. Because p-stranding in Spanish was rejected by all participants, it is possible that even though the age of acquisition of English varied, potentially the input in Spanish was not as variable, thus enabling the development of D-to-P incorporation across the board, regardless of when they were exposed to English. With the data available here, we can only postulate these explanations as broad possibilities, but regardless, what we can say is that the current study helps continue to show that heritage speakers are not a monolith. On that note, it is worth noting that, upon visual inspection of the data by participant, there were three individuals who patterned like the early sequential bilinguals in previous studies. They differed from the group as a whole, accepting p-stranding across the board (in both languages and in all CS sentences). However, all three of these participants listed their age of acquisition of Spanish as age 5 or 6, suggesting simultaneous exposure to both languages is not what led to such universal acceptance of the structure. In terms of what they have in common, by comparing their background questionnaires, there is no immediately clear uniting characteristic, but it at least suggests that p-stranding acceptance in Spanish is not solely based on age of acquisition.

Turning back to the specifics of the current findings, before we discuss the results of the RQs, which focus specifically on CS, let us first discuss the monolingual data in more detail. Recall that we tested monolingual Spanish and English sentences in all the experimental contexts (i.e., both p-stranding and pied-piping in the three different structures with various lexical prepositions). The p-stranding results showed that there was a significant effect for language—the participants rated p-stranding in

English significantly higher than p-stranding in Spanish. This result was expected since it follows canonical rules for both languages, exhibiting the expected asymmetry between the two. For pied-piping, though, the results were somewhat unexpected. We hypothesized that pied-piping should be accepted in both languages since it is canonically permissible in both. Our results, however, showed that while it was accepted in Spanish, it was significantly less acceptable in English. The question arises as to why this is the case. Perhaps it could be due to individual variation—is this an acceptable construction in English for all speakers? A more likely explanation is that the findings are just showing that pied-piping is acceptable primarily due to prescriptive influence, as it is most frequently used only in very formal situations, while it is rarely used in everyday speech (Biber et al., 1999). Given the fact that CS is commonly understood to be a phenomenon more appropriate for informal contexts (as prescriptively formal contexts necessitate linguistic “purism” via the complete separation of the two languages), it is possible that by having the participants complete the monolingual judgments *after* the CS judgments, it influenced their ratings on English pied-piping, as they were primed to be in informal mode.

Now let us turn to our RQs, discussing each in turn. The first question asked if US heritage speakers of Spanish accept p-stranding in Spanish-English CS. Our results show that our participants did accept it, but asymmetrically, as they judged p-stranding as more acceptable in Spanish-to-English CS (29) than English-to-Spanish CS (30).

- (29) *Qué hombre* is Ashley dancing with?
 what man
 ‘What man is Ashley dancing with?’
- (30) * What guy *está bailando Araceli con*?
 is dancing Araceli with
 ‘What guy is Araceli dancing with?’

These findings are in line with Koronkiewicz (2022), as it seems that the language of the preposition is driving the availability of p-stranding. Essentially, since the English preposition is not dictating a need for D-to-P incorporation, its complement is free to undergo wh-movement, regardless of whether it is an English or Spanish DP. For Spanish prepositions, though, their grammar includes the crucial syntactic restriction that blocks p-stranding (i.e., D-to-P incorporation). As argued previously by Koronkiewicz, it seems that such incorporation in their Spanish grammar does present itself in CS, but only in specific contexts; specifically, these results suggest that it is the language of the preposition and not the determiner that determines that incorporation.

The two sub-questions of RQ1 ask if the acceptance varies by structure (i.e., matrix wh-questions, embedded wh-questions, and relative clauses) and if the judgments vary by lexical preposition (i.e., *with/con*, *a/to*, *de/of*). Our results show that, in the end, the (un)acceptability of p-stranding in Spanish-English CS by heritage speakers of Spanish does not vary based on these factors. By expanding the syntactic structures and the specific prepositions (especially by including those that have suppletive forms in Spanish), these results clearly address one of the original limitations of Koronkiewicz’s earlier study, suggesting that p-stranding acceptability

- (35) *Con* what guy *está bailando Araceli*?
 with is dancing Araceli
 ‘With what guy is Araceli dancing?’

Turning back to our broader findings, the main pattern that stands out the most in our study is that the preference between p-stranding and pied-piping in CS sentences lies in the language of the preposition. That is, if the preposition was in English, then p-stranding was preferred, while if the preposition was in Spanish, then pied-piping was preferred, regardless of whether the sentence was monolingual in nature or involved CS. This result is similar to what Koronkiewicz (2022) also found, lending further support for Law’s (2006) analysis and the conclusion that the language of the preposition does have an effect. Recall that Law states that D-to-P incorporation occurs in languages where there are instances of suppletion, such as Spanish. With the inclusion of the two prepositions that do have phonological D-to-P incorporation in Spanish (*a* → *al* and *de* → *del*) along side of one that does not (*con* → *con el*), the uniform findings suggest that we have evidence that incorporation occurs regardless of whether a specific preposition has a suppletive form—in other words, as Law suggests, it is all or nothing. Surprisingly, the unexpected result of the low ratings of pied-piping in English could perhaps be accounted for with Law’s analysis. If English does not have a suppletive form, therefore no incorporation, then we should not expect pied-piping to be licensed. It is possible that the acceptability of pied-piping in English is not tied to anything within the speakers’ grammar, but rather merely adherence to a prescriptive rule.

On that note, future studies should look more in-depth at the status of pied-piping in English. In this study, we found that the participants were rating pied-piped English sentences toward the middle of the scale. This was a surprising result since, in theory, pied-piping is perfectly acceptable in English, and should thus have received high scores. An experiment could be designed that tackles formal and informal contexts, for example, to help tease apart our understanding of this structure in English. Relatedly, as already mentioned, it would also be interesting to see how reduplication of the preposition would be considered by such participants.

6. Conclusion

This study is an extension of Koronkiewicz (2022), where we used an AJT to test the acceptability of p-stranding and pied-piped CS sentences in different structures (matrix wh-questions, embedded wh-questions, and relative clauses) and with different prepositions (with/*con*, to/*a*, and of/*de*) by heritage speakers of Spanish. Our results showed that the participant’s preference for p-stranding or pied-piped patterned mainly with the language of the preposition, further supporting the conclusions in Koronkiewicz (2022). This also lends evidence to Law’s (2006) analysis that D-to-P incorporation, and thus a restriction on p-stranding, is driven by the preposition, and it does not matter whether a specific preposition has a suppletive form

This experiment is a solid second step in understanding p-stranding and pied-piping availability in Spanish-English CS. It suggests that our population has D-to-P incorporation in Spanish, which at times also presents itself in switched contexts, and

it is the properties of the preposition, and not the determiner, that dictate incorporation in both monolingual and CS contexts. Finally, this is one more study that shows how bilingual data can be used to better understand the syntactic underpinnings of linguistic theory.

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