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Code-switching at the interface between language, culture, and cognition

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Abstract

Bilinguals commonly draw on their two languages within a single speech event, a practice known as code-switching. On the basis of different methods and bilingual populations, various theoretical accounts of code-switching have been developed. Yet, while theories proliferate, cross-fertilization between them remains limited. Hence, the question that guides this paper is: how can we better understand the nature of mixed interactions, with a view to creating more accurate models of (multilingual) language competence? We show how a multimethod, comparative approach that integrates linguistic, psycholinguistic and social factors will help us draw a distinction between which code-switching patterns are uniform across communities and language pairs, and which patterns are variable. Addressing both the nominal and verbal domains, we present findings from a series of comparative studies that investigate how bilinguals from different communities produce, judge, or process bilingual structures. We discuss to what extent bilinguals (i) produce strings that can be seen as having the same syntactic structure within and across communities, (ii) make the same linguistic judgments, and (iii) converge in their processing of these strings. We highlight the importance of surveying the patterns that emerge across communities, rather than on an example and counter-example basis, in order to bring our understanding of code-switching, and of language as a whole, forward.

1. Introduction: Challenges in evaluating code-switching theories

In this paper, we will reflect on the competing theoretical and methodological tensions in the structural study of code-switching (CS), that is, the multilingual practice where speakers “go back and forth” between their languages within the same a conversation, either between clauses (inter-clausal) or within the same clause (intra-clausal; Deuchar, 2012). An example of intra-clausal CS can be observed in the utterance produced by a Dutch-Portuguese bilingual in Brazil in (1). A Portuguese noun (*italics*) is inserted into an otherwise Dutch clause without signs of effort or hesitation.

- (1) je moet echt een beetje *criatividade* hebben
you must really INDEF little creativity have.INF
'You must really have a bit of creativity.' (Greidanus Romaneli, in prep.)

The intra-clausal CS of a New York Puerto Rican Spanish-English bilingual was identified by Labov (1971: 457) as “the irregular mixture of two distinct systems”. Nevertheless, by the end of the 1970s, structural constraints on CS were being proposed (Pfaff, 1979), and today CS is widely accepted as rule-governed behavior, in other words

there are boundaries in speech where it is allowed or disallowed. As such, CS data should be incorporated into any theory of possible mental grammars (López, 2020). Mixed language data is also valuable because it permits combinations of formal properties that are hidden in the examination of a single language (e.g., contrasting word order), helping us to refine and deepen our understanding of grammatical theory.

While numerous theories have been developed to explain CS structure, efforts to integrate empirical findings have met various theoretical and methodological challenges. Here, we briefly illustrate the spectrum of these theoretical approaches, highlighting two challenges hampering theoretical convergence in the field: the absence of community norms in theoretical models, and the difficulty of adjudicating between findings from different methodologies.

1.1 Theoretical approaches

Explanations of CS structure can be roughly divided into two groups: those that posit additional mechanisms to handle mixed language data, and those that do not (see Table 1 below for a non-exhaustive overview).

Table 1. Non-exhaustive overview of structural approaches to CS since the 1980s.

<i>Approach</i>	<i>References</i>
Code-switching constraints <i>(e.g. Equivalence Constraint</i> <i>Reformulation of the Equivalence Constraint</i> <i>Government Constraint</i> <i>Functional Head Constraint)</i>	Poplack 1980 Woolford 1983 DiSciullo, Muysken & Singh 1986 Belazi, Rubin & Toribio 1994
Constraint-free / “Null” theories	Mahootian 1993 MacSwan 1999, 2000 Chan 1999 Eppler 2006 Alexiadou, Lohndal, Åfarli & Grimstad 2015 López 2020
Asymmetry between languages <i>(Matrix Language Framework)</i>	Myers-Scotton 1993, 2002 Joshin 1982
“Psycholinguistic” Gradient Symbolic Computation	Goldrick, Putnam & Schwarz 2016 Putnam, Carlson & Reiter 2018 Putnam & Klosinski 2020
“Socio-cognitive” Optimality Theory	Bhatt & Bolonyai 2011
Bilingual speech taxonomy <i>(Insertion, Alternation, Congruent Lexicalization, and Backflagging)</i>	Muysken 2000, 2013
Usage-based	Backus 2015

In the 1980s and early 1990s, constraint-based approaches tried to explain the points at which a code-switch can occur. These constraints included a proposed necessity for coinciding structures between the participating languages (Pfaff, 1979; Poplack’s *Equivalence Constraint*, 1980), a prohibition of switches after a bound morpheme (Poplack’s *Free Morpheme Constraint*, 1980), a requirement for elements that stand in a government relation to come from the same language (DiSciullo, Muysken, & Singh’s

Government Constraint, 1986), and for functional heads and their components to come from the same language (Belazi, Rubin, & Toribio's *Functional Head Constraint*, 1994). However, evidence from different language pairs contradicting many of these constraints soon emerged (Bentahila & Davies, 1983; Berk-Seligson, 1986; Nartey, 1982), leading to the later reformulation of these constraints (Deuchar, 2005; Sebba, 2009).

The constraint-based approach was also challenged by the “null” view that no structural restrictions should operate specifically on CS. Instead, proponents of this approach argue that CS should be explained - and explainable - using the same mechanisms applied to monolingual grammars (e.g., generativist proposals such as Mahootian, 1993; MacSwan, 1999, 2000; Chan, 1999; Alexiadou, Lohndal, Åfarli & Grimstad, 2015; López, 2020; cf. also Eppler, 2006 using word grammar). Critics of these approaches have noted that they may not be suited to explain the creation of new code-switched structures not available in either of the individual languages, nor can they explain variation between speakers of the same language pair in different communities (Toribio, 2017).

The observation that many code-switched utterances feature an asymmetrical involvement of the participating languages led to the generation of the Matrix Language Framework (MLF; Myers Scotton 1993, 2002; see also Joshi, 1982). This account generalizes that in code-switched utterances one of the languages - the matrix language - provides the morphosyntactic frame, while the other language - the embedded language - contributes embedded elements. Moreover, the MLF predicts that only certain ‘open class’ items can be drawn from the embedded language (with the exception of embedded language “chunks”), whereas no such restriction applies to the matrix language. The requirement for one language to act as the matrix language also applies to unilingual speech, therefore the MLF is claimed not to require CS-specific constraints (Jake, Myers-Scotton & Gross, 2002; cf. MacSwan, 2005).

Others have attempted to reconcile structural explanations with the socio-pragmatic functions of CS (e.g. Chan, 2009 who highlights the role of processing and sociolinguistic factors). Most notable in this respect is Muysken's (2000, 2013) typology of code-switching, which identifies four types of code-switching that reveal different levels of contribution from the two languages: insertion (of individual items), alternation (the juxtaposition of material from different languages), congruent lexicalization (denser types of code-switching with shared structures), and backflagging (the use of other-language clause-peripheral markers). In this account, a variety of factors that influence the particular outcome of each multilingual situation are elaborated, such as typological distance, political distance or community norms. In a similar vein, Bhatt and Bolonyai (2011) employed a framework of bilingual grammars based on Optimality Theory. They identified a repertoire of socio-pragmatic functions, such as display social affiliation or express a specific concept more economically, whose relative importance in a community could help predict preferred code-switched structures in bilingual communities. Finally, Backus (2015) proposed a usage-based analysis of code-switching structure, in which the pragmatic function of a specific linguistic form (e.g., words, schematic structures) and the frequency with which it is used in a community influences individual speakers' likelihood of producing this form. This way, CS is linked to other language contact phenomena, as a synchronic practice leading to language change over time.

More recently, Gradient Symbolic Computation, a formalism to account for the systematicity of CS patterns by integrating psycholinguistic notions of bilingual co-activation with generativist accounts of grammar, was proposed (Goldrick, Putnam & Schwarz 2016; Putnam & Klosinski 2020).

A continued lack of convergence between these varying theoretical approaches has been characterized as demonstrating “little cross-fertilization” between CS theories (Poplack, 2001: 2063), leading to a situation where a “culture of example and counterexample” predominates (Toribio, 2017: 228). Unifying the findings from these comparisons has proved challenging due to their differing methodologies and populations sampled (e.g., Fairchild & van Hell, 2017; Herring, Deuchar, Parafita Couto, & Moro Quintanilla, 2010; Pablos, Parafita Couto, Boutonnet, Jong, Perquin, Haan & Schiller, 2018; Parafita Couto, Deuchar & Fusser, 2015; Parafita Couto, Boutonnet, Hoshino, Davies, Deuchar & Thierry, 2017; Ramírez Urbaneja, 2020; Vaughan-Evans, Parafita Couto, Boutonnet, Hoshino, Webb-Davies, Deuchar & Thierry, 2020). Furthermore, contrasts between constraint-free approaches and the MLF, in particular, have yielded findings either inconclusive or consistent with both accounts (e.g., Parafita Couto, Deuchar & Fusser, 2015; Eppler, Luescher & Deuchar, 2017; Pablos et al. 2019; Parafita Couto & Gullberg, 2019). We propose that there are two key challenges that need to be addressed in order to move away from this current situation; the integration of community norms into theoretical frameworks, and the need for more multi-method studies. Moreover, the field would greatly benefit from the same multiple methods being applied across communities in a systematic and coordinated fashion.

1.2 Challenge 1: Role of community norms

Despite the inclusion of community norms in some explanatory models of CS (e.g. Muysken, 2000; Backus, 2005), the role of local speech practices remains under-represented in much CS research to date (cf. Chan, 2009). If we understand that the acquisition of code-switching, similarly to the acquisition of one language, occurs through exposure to the production of other speakers within the community, it is plausible that the acquisition of CS patterns should reflect practices of the community, rather than varying based only on language-internal principles. If unaccounted for, community norms can confound results obtained from a single language pair and a single speaker community, hindering efforts to generalize these results into universal accounts of code-switching structure.

However, most of the theoretical approaches focused on CS rely on single-community data for each language pair, ignoring factors related to local CS practices. This overall neglect displays what Haspelmath (2020) describes as a “cognitive bias” throughout the last few decades in linguistics, causing the cultural aspect of language to be sidestepped. In order to overcome this bias, to account for the potential interacting role of community norms, and to develop better evaluations of the existing structural accounts of code-switching, systematic cross-community comparisons within and between language pairs are necessary. By conducting such studies, CS researchers will be able to identify universal versus community-specific aspects of CS structure (see Sections 2-4).

1.3 Challenge 2: Comparing results across methodologies

Despite a wealth of observations of CS structures in different language pairs, their frequency distributions in naturalistic data have not yet made it possible to reliably differentiate between the predictions of different theoretical accounts. While CS research has expanded from well-established methods (e.g., acceptability judgements) to new ones (e.g., elicited production paradigms; electrophysiological measures), conflicting results from naturalistic and experimental studies raise concerns about the reliability of employing any single methodology in isolation, as well as regarding the interpretation of data from different sources. Indeed, researchers have highlighted the importance of systematizing corpus-building and access to naturalistic code-switching data (Toribio, 2017), developing rigorous experimental designs, and combining methodological approaches (Gullberg, Indefrey & Muysken, 2009; Munarriz, Parafita Couto & Vanden Wyngaerd, 2018).

The objective of raising these two confounds, community norms and methodological comparisons, is not to discount the impact of single-community or single-methodology data, which remain relevant to the description of the specific communities to which they refer. Rather, only by providing converging data from different methodologies and comparing performances across communities can we investigate effects specific to the community and to dissociate those from potential universal tendencies in code-switching and structural effects of the languages involved.

In what follows we will focus on three code-switching phenomena: asymmetries in the language and gender of the determiner (Section 2), the relative order of adjective and nouns (i.e., conflict sites) (Section 3) and the creation of mixed language verbs (Section 4). We present data to illustrate these phenomena using a multimethod comparative approach, linking linguistic, psycholinguistic and social factors. This enables us to discuss the extent to which bilinguals (i) produce strings that can be seen as having the same syntactic structure, (ii), make the same linguistic judgements, and (iii) converge in their processing of these strings.

2. Asymmetries in the DP

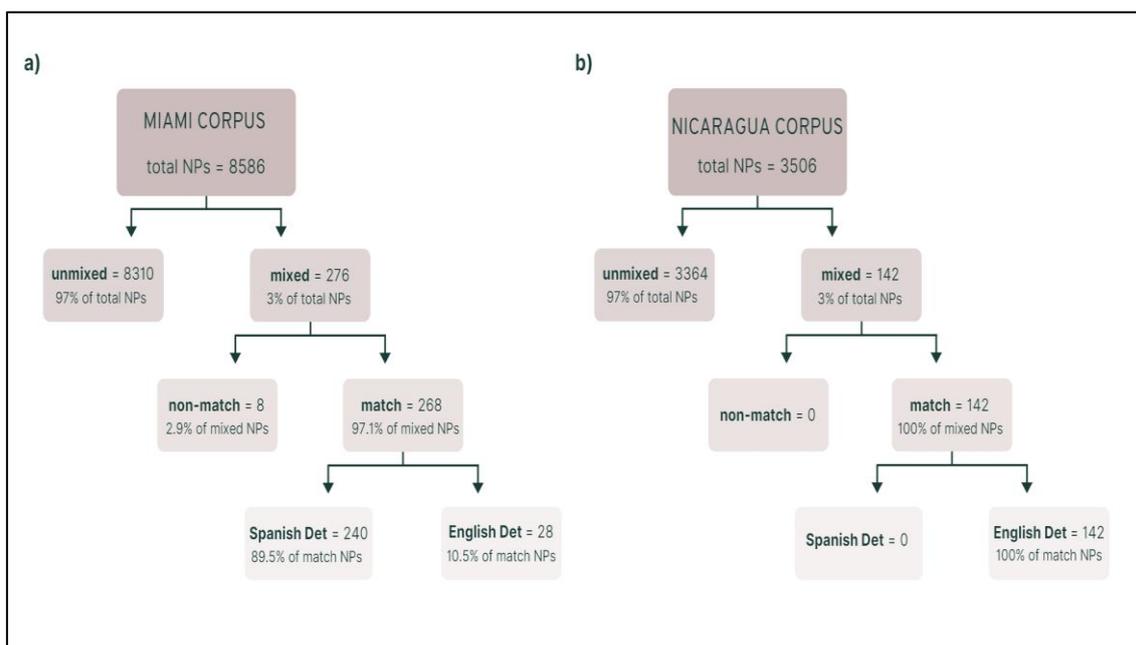
2.1 Language of the determiner

Previous work on Spanish-English code-switching has revealed an asymmetry whereby mixed nominal constructions with a Spanish determiner, e.g. *el book*, are more commonly produced than those with an English determiner, e.g. *the libro* (Liceras, Fernández Fuertes, Perales, Pérez-Tattam & Spradlin 2008; Moro Quintanilla 2014; Valdés Kroff 2016). Liceras et al. (2008) explain this by suggesting that bilingual speakers favor the determiner with the largest number of uninterpretable features (here, Spanish), labeling this the *grammatical features spell-out hypothesis* (see also Moro Quintanilla 2001, 2014). However, these studies do not control for the broader morpho-syntactic frame of the clause surrounding the DP. This interaction is particularly relevant, as the Bilingual NP Hypothesis within the Matrix Language Frame Model predicts that determiners in mixed nominal constructions should come from the matrix language of the clause (Jake, Myers-Scotton & Gross 2002). According to this account, Spanish determiners are predicted to surface in clauses with a Spanish matrix language, whereas English determiners are predicted to surface in clauses with an English matrix language.

Accounting for the matrix language of the clause, Herring, Deuchar, Parafita Couto and Moro Quintanilla (2010) investigated the use of determiners in mixed Spanish-English Determiner-Noun constructions in a sample of the Bangor Miami Corpus (<http://bangortalk.org.uk>). They observed, in accordance with the established asymmetry, that mixed DPs with Spanish determiners are more frequently observed than those with English determiners (see Table 2). More importantly the language of the determiner almost always matched the language of the verb and, therefore, the matrix language of the clause, supporting the Bilingual NP Hypothesis.

Following up, Blokzijl, Deuchar, and Parafita Couto (2017) compared the entire Miami corpus with data from sociolinguistic interviews with Spanish-English creole speakers in Nicaragua, and found the opposite pattern of determiner use between the two corpora. In the Nicaraguan corpus, all of the mixed DPs featured an English determiner, yet none with a Spanish determiner were observed. But, similar to the pattern found in the Miami corpus, the language of the determiner always matched the matrix language of the utterance. A summary of the frequencies of these constructions in both corpora can be found in Figure 1.

Figure 1. Nominal construction frequencies in the Bangor Miami Corpus and the Nicaragua Corpus



Note: Noun phrases (NPs) are divided between mixed and unmixed, between those with a match between the matrix language and the language of the determiner (match) or not (non-match), and between the language of the determiner matching with the matrix language (Spanish or English).

Moving beyond purely Spanish-English studies, Parafita Couto and Gullberg (2019) compared the language of the determiner in mixed DPs in corpora of Welsh-English, Spanish-English, and Papiamentu-Dutch bilingual speech. In each of these pairs, one of the languages featured grammatical gender (Spanish, Welsh and Dutch) and the other did not (English and Papiamentu). Their results for Welsh-English DPs show a preference for Welsh determiners, while Welsh was also the matrix language in all of the utterances. For Papiamentu-Dutch, Papiamentu was the preferred language for the determiner and the matrix language of all utterances. Finally, for Spanish-English, Spanish determiners were

predominantly preferred, and Spanish was the matrix language in the majority (79%) of utterances. These results indicate an effect of the language of the morphosyntactic frame on the choice of determiner, in alignment with the Bilingual NP Hypothesis (Jake, Myers-Scotton & Gross, 2002). The presence of grammatical gender coincided with the language of the determiner in Welsh-English and in Spanish-English, but not in Papiamentu-Dutch, contrary to predictions following Licerias et al. (2008) and Moro Quintanilla (2014). Table 2 provides an overview of recent studies and datasets, all of which show a match between determiner and matrix language.

Table 2. Naturalistic production datasets showing a match between determiner and matrix language in mixed determiner-noun constructions.

<i>Language Pair</i>	<i>Corpus</i>	<i>Data characteristics</i>	<i>Studies</i>
Spanish-English	Miami Corpus	<ul style="list-style-type: none"> ● 85 adult speakers (52 female) ● Dyads ● Collected in Miami, FL, US ● Mixed NPs $n=276$ 	Herring et al. (2010): subset of 5:27h (19 speakers) selected
			Blokzijl, Deuchar, & Parafita Couto (2017): full corpus
			Parafita Couto & Gullberg (2017): subset 5:27h/20 (19 speakers) selected
	Nicaragua Corpus	<ul style="list-style-type: none"> ● 42 adult speakers ● 12 hours ● Dyads or groups ● Collected in 2006 in the South Atlantic Coast area of Nicaragua ● Mixed NPs $n=142$ 	Blokzijl, Deuchar, & Parafita Couto (2017): full corpus
	<i>Las Pláticas</i> Corpus	<ul style="list-style-type: none"> ● 14 adult speakers ● 10 hours ● Collected in 2018 in New Mexico, US ● Mixed NPs $n=259$ 	Ramírez-Urbaneja (2020): full corpus
	Three corpora from the CHILDES database	<ul style="list-style-type: none"> ● 15 child speakers ● Ages (1;11 to 6;4) ● Collected in Los Angeles, CA, US, Michigan, US, and Spain ● Mixed NPs $n=202$ 	Ramírez-Urbaneja (2020): full corpora
Welsh-English	Siarad Corpus	<ul style="list-style-type: none"> ● 151 adult speakers (81 female) ● Dyads ● Collected at the Centre for Research on Bilingualism, Bangor, UK ● Mixed NPs $n=171$ 	Parafita Couto & Gullberg (2017): subset of 18:40h /40 (42 speakers) selected

Dutch-Papiamentu	MPI Corpus	<ul style="list-style-type: none"> • 25 adult speakers (15 female) • 3 hours • Four-party conversations • Collected at the MPI for Psycholinguistics, the Netherlands • Mixed NPs $n=60$ 	Parafita Couto & Gullberg (2017): subset of 3h (25 speakers) selected
German-English	Eppler's 2003 corpus of German/English spoken interaction	<ul style="list-style-type: none"> • 9 adult speakers • 18:16 hours • Collected in London, UK • Mixed NPs $n=187$ 	Eppler, Luescher, & Deuchar (2017): subset of 18:16 hours (9 speakers) selected

Taken together, the corpora results highlight both a striking symmetry and asymmetry across language pairs. They all show a co-occurrence of finiteness (i.e. the matrix language) and the language of the determiner, contrary to the claims of lexicalist approaches (Liceras et al., 2008; Moro Quintanilla, 2014). Yet despite the consistency between the matrix language and the language of the determiner, different preferences for the matrix language emerged across language pairs and communities. But why is this? It has been suggested that differences could originate from social factors, such as the language of power or prestige in a community (e.g. Blokzijl et al., 2017, Parafita Couto & Gullberg, 2019).

Complementing the production data reported above, acceptability judgements have also been collected. Since production frequency may not necessarily reflect ungrammaticality, acceptability judgments can supplement naturalistic data with negative evidence against dispreferred constructions. To this end, Parafita Couto and Stadthagen-González (2019) manipulated the language of the determiner and the matrix language of Spanish-English code-switched sentences, employing two types of acceptability judgement tasks: a traditional Likert-scale acceptability judgement and a two-alternative forced-choice acceptability judgement (2AFC) task. These tasks were compared in light of issues identified with the use of acceptability judgments in code-switching research, as traditional acceptability judgements might be sensitive to negative attitudes against code-switching held by bilingual speakers. Both tasks yielded similar results, whereby constructions with Spanish and English determiners were accepted in similar rates, as long as the language of the determiner matched that of the matrix language of the clause.

The judgment results confirm those from the corpora, namely that the language of the determiner in mixed DPs generally matches the matrix language, but that the choice of matrix language may vary between communities and language pairs. This suggests that bilingual communities do not always follow the same pattern, and that social rather than grammatical factors may be at play in this asymmetry.

2.2 Gender of the determiner

If the determiner in a mixed DP comes from a gendered language (i.e. where gender is marked on the determiner), then it must be marked for gender. It is often the case that the noun comes from a genderless language, as in (2), an attested switch between gender-

Iriondo (2017)	AJ	ending + analogical gender) Written stimuli 12 lexical items (analogical gender)	Spanish dominant area 12 L1S-eL2B bilinguals Spanish dominant area	Analogical criterion
Badiola & Sande (2018)	AJ	Written stimuli Forced choice task 20 lexical items (phonological ending + analogical gender)	21 simultaneous bilinguals Basque dominant area	Phonological ending (-a _{fem}) Masculine preferred
Basque-Spanish Munarriz, Ezeizabarrena, de Castro Arrazola & Parafita Couto (In press)	EP	Forced-switch director matcher task	30 early sequential bilinguals with different profiles and areas	L1 Spanish: Analogical gender > phonological ending L1 Basque: Phonological ending > analogical gender
Purepecha-Spanish Bellamy, Parafita Couto & Stadthagen González (2018)	EP	Forced-switch director matcher task & 2 alternative forced choice task	12 Purepecha-Spanish early sequential bilinguals (Purepecha L1)	Production task: masculine default Judgment task: phonological cue No analogical gender
Spanish-English across communities Królikowska, Bierings, Beatty Martínez, Navarro Torres, Dussias & Parafita Couto (2019)	EP	Code-switching map task	Granada (Spain) 40 Spanish L1-English L2 late bilinguals State College (Pennsylvania, USA): 40 Spanish-English early bilinguals (heritage Spanish) San Juan, Puerto Rico: 10 Spanish-English early bilinguals (Spanish dominant community) El Paso (Texas, USA): 14 Spanish-English early bilinguals	Granada & El Paso: strategies divided (analogical + masculine assignment) State College & Puerto Rico: masculine default The more code-switching in the community, the more the default strategy is used

*AJ = Acceptability judgment task, EP = Elicited production.

We can observe that the analogical criterion is only favored by Spanish L1 bilinguals, that is, by speakers who acquired the language with grammatical gender first (cf. Licerias et al., 2008). This distribution of use of the analogical strategy seems to be consistent across the communities sampled to date, indicating an effect of order of acquisition. In contrast, the use of a default gender is widespread and its frequency appears to be related to the frequency of CS in a community; more habitual code-switchers switch more than non-habitual ones (Królikowska et al., 2019). Similar trends have also been noted for Spanish, Papiamento and Turkish heritage bilinguals in The Netherlands (Boers et al., 2020). For a comprehensive overview of gender assignment preferences in bilingual

communities and a discussion their possible conditioning factors, see Bellamy and Parafita Couto (accepted).

2.2.1 Acquisition of gender assignment strategies

Differences within the same language pair, as well as the observed asymmetries they produce, highlight the role of exposure to community norms during the acquisition of code-switching patterns. Asymmetries such as the use of a default gender assignment strategy are not obtained during the acquisition of the individual language systems (e.g., English and Spanish), but “must be learned amongst a community of codeswitchers” (Valdés Kroff, 2016: 297). This raises the key question as to when these asymmetries are acquired by bilingual children. To date, only a small number of studies have made a detailed comparison of the specific morphosyntactic patterns found in corpora of adult and child multilingual language usage (cf. Deuchar, forthcoming).

Recently, Balam, Lakshmanan and Parafita Couto (2021) investigated the production of grammatical gender by 40 Spanish-English bilingual children (aged 7-8 and 10-11 in both English immersion and two-way bilingual school programs) in Frog Story narratives in Miami Dade, Florida. For unilingual Spanish constructions, the authors found that all children used both feminine and masculine gender determiners, and produced gender assignment errors in less than 5% of the recorded examples. This strongly suggests that the children had successfully acquired the Spanish gender system. As for mixed DPs (n = 220), children used predominantly masculine determiners (in 97.8% of instances), a default pattern similar to that also reported for adult speakers in Miami (e.g., Valdés Kroff, 2016). Therefore, these bilingual children seem to have acquired both the gender system of the gendered language, Spanish, as well as the community patterns for the use of (masculine) gender in code-switching mode, as early as the age of seven (cf. Licerias et al., 2008 who find both analogical and default strategies amongst 2L1 Spanish-English children in Spain).

We recommend that future research should use adult data to establish bilingual communicative norms across communities, and then, assuming it is representative of the community input to children, the children’s bilingual communicative patterns should be studied in relation to the community norms. We expect that such an approach would provide very different adult and, perhaps also child, language distribution patterns which could be highly informative in cross-community comparisons.

3. Conflict sites: Adjective-noun order

In this section we will present conversational, judgment and EEG data to demonstrate how bilingual speakers deal with conflicting linear orders of nouns and adjectives in mixed NPs. Conflict sites in code-switching, as introduced by Poplack and Meechan (1998: 132), are “a form or class of forms which differs functionally, structurally, and/or quantitatively across comparison varieties”. The target structure here is a complex NP comprising a determiner, an adjective and a noun. For instance, languages such as Dutch typically favor an Adjective-Noun word order (4), whereas a Noun-Adjective word order prevails in languages such as Papiamentu (5).

- (4) un refresco berde
DET drink green
'a green drink'
- (5) een groen drank-je
DET green drink-DIM
'a green drink'

A switch between the noun and adjective (or vice versa in linear terms) would violate the Equivalence Constraint (Poplack, 1980; Sankoff & Poplack, 1981) and should therefore not occur. Yet naturalistic data shows that they clearly do; take the Papiamentu-Dutch *un dushi verblijf* 'a nice stay', for example, where the Papiamentu adjective precedes the Dutch noun, contrary to canonical unilingual constituent order (Parafita Couto & Gullberg, 2019).

Different theoretical frameworks make competing predictions regarding which adjective-noun linear orders would be attested and accepted in mixed complex NPs. For example, within the Minimalist Program, Cantone and MacSwan (2009) arrive at the descriptive generalization that the language of the adjective determines whether it appears before or after the noun (cf. Cinque, 2005). In contrast, the morpheme-order principle within the MLF states that adjective-noun order will match the word order of the matrix language of the utterance, regardless of the language of the adjective (Myers-Scotton, 2002).

Let us begin with findings from naturalistic data. Mixed NPs containing a determiner, noun and adjective from Welsh-English, Spanish-English, and Papiamentu-Dutch (where the first language of the pair has post-nominal adjectives and the second, prenominal) showed that most switches occurred between the determiner and the adjective-noun cluster, and that word order within those same language clusters generally followed the language of the adjective (Parafita Couto & Gullberg, 2019). However, in the nine instances with switches between noun and adjective, the matrix language predicted the observed word order. Counterexamples to the predictions of Cantone and MacSwan (2009) were found in the Welsh-English and Papiamentu-Dutch corpus, where English ($n=1$) and Dutch ($n=6$) adjectives in postnominal position. Similar patterns were also observed in the naturalistic production data of Spanish-English bilinguals in Northern Belize (Balam & Parafita Couto, 2019), as well as by Spanish-English bilingual children and adults in the USA (Ramírez Urbaneja, 2020).

Parafita Couto, Deuchar and Fusser (2015) addressed the same phenomenon in Welsh-English code-switching, using a multi-method approach that included the comparison of naturalistic production data, elicited productions, and acceptability judgements. The naturalistic production results show a preference for post-nominal adjectives (94.1%), regardless of the language of the adjective. These results do not fully support a matrix language or a generative based account of nominal word order. The authors point out that since Welsh is the only matrix language found in the corpus, it is not possible to contrast both models as the data generally adheres to the predictions of both models. Elicitation data from a Director-Matcher Task (Gullberg et al., 2009) contained 168 mixed NPs including an adjective. Just like in the naturalistic production data, in all instances Welsh was also the matrix language. These mixed NPs included mostly English noun insertions with post-nominal Welsh adjectives ($n = 132$), although combinations of a Welsh noun

and an English adjective ($n = 15$) as well as unilingual English constructions with post-nominal adjectives ($n = 13$) were also recorded. The data from the judgment task was not useful as participants rejected all stimuli, probably due to the stigmatized nature of code-switching in this community.

Unlike production and judgment tasks, electrophysiological data has the potential to measure more automatic reactions, as this technique appeals less to participants' metalinguistic knowledge and attitudes. However, there is a scarcity of Event Related Potential (ERP) studies examining switching between different items within the sentence level (at a conflict site), where both semantic and syntactic information need to be integrated. An initial study on Welsh-English mixed NPs by Parafita Couto et al. (2017) compared sentences in which the word order supported the predictions of the MLF (Myers-Scotton, 2002), of Cantone and MacSwan (2009), violated both predictions, or supported both predictions. Sentences including a mixed nominal construction were visually presented to participants ($n = 20$) word-by-word, and scalp potentials were measured after the onset of the adjective. The authors found a larger amplitude in the positive-going waveform peaking approximately 300ms following the presentation of the adjective for the condition in which the MLF prediction was supported, compared to the condition in which Cantone and MacSwan's prediction was supported. However, no significant differences in amplitude were found in the comparison between the condition in which both predictions were supported versus the one in which they were both rejected. One potential explanation for this result is that participants were slightly more dominant in Welsh, and this might have led them to activate Welsh syntax in processing the stimuli where the morphosyntactic frame is English but the noun adjective order is Welsh (Sanoudaki & Thierry, 2014). Another factor that may explain the null results in this comparison is that the adjective occurred in sentence-final position, which may lead to wrap-up effects (Hagoort et al., 2003). The authors acknowledge this limitation and suggest that in a future study the inclusion of a prepositional or adverbial phrase at the end of the sentence may help to settle these ambiguous results.

A similar study was conducted for Papiamentu-Dutch mixed NPs (Pablos et al., 2019). Event-related potentials were also measured following the rapid serial visual presentation to participants ($n = 20$) of sentences manipulated to fulfill the matrix language versus adjective-based predictions. No significant difference at any latency or at any particular location could be found in the analysis of the comparisons conducted. These results could suggest that CS is not restricted at modification sites in Papiamentu-Dutch bilinguals (cf. DiSciullo, 2014), or they might even suggest that CS is completely disallowed (cf. Poplack's (1980) Equivalence Constraint) in this community.

Following the methodological recommendations by Parafita Couto et al. (2017), Vaughan Evans et al (2020) made a further attempt to use ERP data to reconcile theoretical predictions in relation to linear adjective-noun order. They adapted the stimuli of Parafita Couto et al. (2017) to avoid potential wrap-up effects, and also included additional sentence conditions to make it possible to compare across different matrix languages. The results reflect the switching pattern that has previously been reported in naturalistic production in this bilingual community (Parafita Couto et al., 2015), namely a preference

for noun (rather than adjective) insertions. Moreover, the analyses also revealed that predictions of the MLF and the Minimalist Program manifest differently depending on the matrix language of the sentence: when the matrix language was Welsh, sentences that violated both theoretical predictions required greater processing effort. However, when the matrix language was English, ERP responses were not significantly modulated by either set of predictions. It was concluded that the processing of code-switched structures should reflect context-specific patterns that reveal themselves both in production and grammatical judgments (e.g. Beatty-Martínez, Valdés Kroff & Dussias, 2018; Balam et al., 2020).

The competing theoretical predictions have also been tested using judgment tasks. Stadthagen-González, Parafita Couto, Párraga and Damian (2019) tested 42 early Spanish-English bilingual employing both a 5 point Likert scale judgment task and a two alternative forced choice task. Their results revealed an additive effect, as both the language of the matrix language and the language of the adjective determine word order. Voss (2018) replicated the same findings in a sample of Papiamentu–Dutch bilinguals. These results suggest, as argued by Stadthagen-González et al. (2019) and Voss (2018), that progress in our understanding of code-switching can be made by incorporating observations from different frameworks rather than considering them in isolation.

Once again, we can observe strikingly similar patterns across communities. In production, there is a clear avoidance of adjective-noun order switches and a preference for noun insertions. Recent neurophysiological data for Welsh-English (Vaughan Evans et al. 2020) also indicate a preference for noun insertions, and seem to reflect production patterns, which are guided by the matrix language of the utterance. Finally, judgment tasks show an overall sensitivity to both the language of the adjective and of the matrix language of the utterance. Noun insertions are preferred in this modality too, but where an adjective is inserted, speaker preference is for it to follow the order of the language from which it comes.

4. Creativity: Bilingual Verbs

Naturalistic productions from a range of language pairs have demonstrated that bilingual speakers can combine an inflected auxiliary verb in one language (e.g., “do” or “make”) and an infinitive from another language (e.g., Hindi/English Creole, Muysken, 2000; Bengali/English, Chatterjee, 2012; Spanish/English Creole, Fuller Medina, 2005; Balam, de Prada Pérez, & Mayans, 2014; Balam, 2015; Spanish/English, Jenkins, 2003; Spanish/German, González Vilbazo, 2005; González Vilbazo & López, 2011). While these constructions are prevalent cross-linguistically and have been proposed as a potential universal property of code-switching (Edwards & Gardner-Chloros, 2007), the use of auxiliaries as light verbs may not be paralleled in the unilingual speech of the languages involved. These constructions, labelled as “bilingual light verb constructions”

(Balam, 2016), “bilingual compound verbs” (Edwards & Gardner-Chloros 2007), or “do-constructions” (Myers-Scotton 2002), among others, pose the question of how bilingual speakers may create code-switched constructions not readily explained by the grammars of each language.

In Spanish, for instance, the monolingual verb *hacer* ‘do, make’ can function both as a lexical verb of creation and as a causative verb. When incorporated into German-Spanish code-switching, *hacer* is also used as a light verb, losing much of its semantic content (4). This use is, however, restricted to code-switching contexts (González Vilbazo, 2005; González-Vilbazo & López, 2011). Note that the German verb is underlined.

- (4) Vamos a hacer schreiben la Mathearbeit
 go.1PL PREP do.INF write.INF DET.FEM maths.homework
 ‘We will write the maths homework.’
 (Adapted from González Vilbazo, 2005: 202)

The absence of a unilingual *hacer* light verb cannot be explained by a lexical property of the auxiliary if separate lexicons are assumed, since a Spanish verb cannot select for a German verb that is not part of the Spanish lexicon. Indeed, González-Vilbazo and López (2011) interpret *hacer* in mixed speech as a “last resort” realization of *little v*, whereas in Spanish such a last resort is never necessary. Because bilingual verbs cannot be understood solely on the characteristics of the corresponding monolingual verbs, it becomes important to identify what other factors may modulate how these verbs are used and how these constructions emerge.

In mixed verbs more generally, one language provides the auxiliary or light verb while the other provides the lexical verb, as observed earlier in (4). Two principal constructions are attested for mixed Spanish-English verbs: *hacer* ‘do, make’ + V_{INF} (5) and *estar* ‘be’ + V_{INF} (6).

- (5) Nunca he hecho witness un girls’ fight
 never have.1SG do-PASTPART witness-INF a girls’ fight
 ‘I have never witnessed a girls’ fight.’ (Balam, Prada Perez, & Mayans, 2014: 254)
- (6) Estaba training para pelear
 be.IMPF.3SG training to fight.INF
 ‘He was training to fight.’ (Adapted from Pfaff, 1979: 296)

In the naturalistic production of Spanish-English bilinguals, the *hacer* + V_{INF} construction is attested in Belize (Balam, 2015, 2016; Balam, Prada Pérez & Mayans, 2014), as well as in the southwestern USA (Reyes, 1982; Jenkins, 2003; Vergara Wilson, 2013; Vergara Wilson & Dumont, 2015). In contrast, *estar* + V_{INF} combinations are attested infrequently in both the Miami corpus (n = 7) and 88 entries of *La Calentita: Gibraltar’s National Dish*, an editorial column from the Gibraltar newspaper *Panorama* (n = 8; Guzzardo Tamargo, 2012).

However, while there may be some cross-community differences in oral production, these differences may not necessarily be present at the level of judgment. To assess this possible discrepancy, Balam, Parafita Couto and Stadthagen-González (2020) ran a two alternative forced choice task with a total of 106 Spanish-English bilinguals in northern Belize ($n = 44$), New Mexico ($n = 32$) and Puerto Rico ($n = 30$). The task comprised 72 items (36 test items and 36 fillers), controlled for tense, sentence length, lexical verb type, as previous work suggests that light verb constructions in contact Spanish primarily occur with transitive verbs (see Balam, 2015, 2016; Vergara Wilson & Dumont 2015). The four test conditions, including examples of each, were as follows:

- (A) Hacer+ V_{Prog} : [hace auditing] el report.
- (B) Estar+ V_{Inf} : [está audit] el report.
- (C) Hacer+ V_{Inf} : [está haciendo audit] el report.
- (D) Estar+ V_{Prog} : [está auditing] el report.

All groups accepted the *estar* bilingual construction, which has structural equivalents in both languages. Results for *hacer*, however, show different preferences in different communities. While bilinguals from northern Belize consider *hacer* + V_{inf} constructions the most acceptable, speakers from New Mexico preferred *estar* + V_{prog} , followed by *hacer* + V_{inf} constructions. Finally, Puerto Rican bilinguals strongly rejected all conditions, except *estar* + V_{prog} constructions. From a formal perspective, the acceptability of *hacer* (as an overt manifestation of little *v* (González Vilbazo & López 2011) seems to be tied to its exposure and use in naturalistic speech. There are also more sociolinguistic implications: As the northern Belize and Puerto Rican groups show opposite preferences, it may be that intuitions about bilingual verbs may be community-specific, being influenced by participants' previous exposure to these different forms.

The combination of production and acceptability judgement data on bilingual verbs across Spanish-English bilingual communities indicates that this phenomenon, previously proposed as a code-switching universal (Edwards & Gardner Chloros, 2007), is also subject to the effect of the differential exposure bilingual speakers have to each structure. Results from specific communities, such as Belize, further indicate that the frequency and productivity of bilingual verbs can be subject to other language-external factors (Balam, 2016).

5. Conclusion

The case studies provided in the previous sections highlight that, for each code-switching phenomenon, we can observe both uniformity and variability. For determiner-noun switches, the co-occurrence of finiteness and determiner in the same language (i.e. the matrix language) occurs across communities, whereas the choice of matrix language varies. The translation equivalent strategy of gender assignment in mixed NPs is preferred among bilinguals whose L1 possesses gender, whereas the strategy applied can vary between language communities and pairs according to the bilingual profile, CS

frequency and the tasks completed. In terms of linear noun-adjective order, we see a preference for noun insertions across the board, as well as for the adjective and noun to be in the same language - switches between these two constituents are not common. However, variation in this mixed structure is yet to be described in detail. As for bilingual verbs, studies across several communities of the same language pair have revealed the *estar* + V_{PROG} construction to be the most acceptable, but the presence and acceptability of *hacer* + V_{INF} to be acceptable to varying degrees, depending on the patterns previously reported in production in these communities.

From this review of asymmetry and conflict sites in the nominal domain, as well as creativity in the verbal domain, we aimed to address the extent to which these code-switching phenomena vary or remain stable across language pairs and communities. These findings strongly suggest that asymmetries are due to extralinguistic factors, such as community norms, rather than structural properties of the participating languages. By presenting results stemming from different data collection mechanisms, we have also demonstrated how a multi-method approach provides a more robust overview of patterns underpinning code-switching behavior. In order to probe these interactions between linguistic and extra-linguistic factors further, we have shown that more research is needed, in both the nominal and verbal domains, across language pairs, between the same language pair but across communities, as well as in the same language pair but between individuals, namely adults vs. children. By building a stronger - and more coordinated - evidence base, we can begin to better understand the nature of bilingual interactions, which will enable us to ultimately build better models of language competence.

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